DOCUMENT RESUME

ED 258 902 SO 016 654

AUTHOR	Hepburn, Mary A., Ed.
TITLE	New Information Technology in Social Science Education: Viewpoints from Europe and the United States. Annual Conference of the Social Science Education Consortium (20th, Athens, Georgia, June 8-11, 1983).
INSTITUTION	Social Science Education Consortium, Inc., Boulder, Colo.
REPORT NO	ISBN-0-89994-301-2
PUB DATE	85
NOTE	230p.; For the unedited versions of these and other papers presented at this conference, see ED 231 733-750.
AVAILABLE FROM	Social Science Education Consortium, Inc., 855 Broadway, Boulder, CO 80302 ($10.00).
PUB TYPE	Viewpoints (120) -- Reports - Descriptive (141) -- Collected Works - Conference Proceedings (021)
EDRS PRICE	MF01/PC10 Plus Postage.
DESCRIPTORS	Cable Television; Cognitive Style; Communications Satellites; *Comparative Education; *Computer Assisted Instruction; Computer Literacy; Computer Simulation; Educational Change; Educational Needs; Educational Practices; *Educational Technology; Elementary Secondary Education; Foreign Countries; *Information Science; *Microcomputers; *Social Studies; Student Attitudes; Teacher Education; Videodisc Recordings
IDENTIFIERS	*Europe; Great Britain; Political Education; West Germany

ABSTRACT

Fourteen conference papers dealing with the effects of electronic information technology on social studies education are provided. Microcomputers received most of the attention, followed by satellite telecommunications, as the conference participants examined implications for student learning styles, student knowledge and attitudes, teacher education, and the content of history and social science courses. The following papers are included: "New Technology: Servant or Master of Social Science Education?" (Roger Homan); "The New Information Technology: Critical Questions for Social Science Educators" (Mary Hepburn); "Alternative Teaching Aids or Why We Can Do without the New Technology in Social Studies and Political Education" (Willem Langeveld); "The New Technology and Social-Political Education in West Germany" (Robert Irvine Smith); "Effects of Electronic Technologies on Opinion Formation and Attitudes of Young People" (Karlheinz Rebel); "The New Technologies and Education in Europe: The Frascati Conference" (Michael Vorbeck); "Computer Applications in Hessen Schools" (Burghard Vilmar); "Analytical Criteria for Microcomputer-Based Simulation/Games" (Roger Berg); "Computer Assisted Learning in Economics, History, and Geography Curricula in England, Wales, and Northern Ireland" (Ashley Kent); "Experiences with Videotex and Expected Effects of Cable TV on Education in West Germany" (Ludwig J. Issing); "Microcomputers in the Social Studies" (James E. Davis and John D. Haas); "Computer Literacy and Social Studies Teacher Education: Needed Changes" (John D. Napier); and "Satellite Telecommunications in Education: An Overview of Related Organizations and Activities" (Paul Schneller). (RM)

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NEW INFORMATION TECHNOLOGY IN SOCIAL SCIENCE EDUCATION: VIEWPOINTS FROM EUROPE AND THE UNITED STATES

MARY A. HEPBURN, EDITOR

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NEW INFORMATION TECHNOLOGY IN SOCIAL SCIENCE EDUCATION: VIEWPOINTS FROM EUROPE AND THE UNITED STATES

Mary A. Hepburn
Editor

Social Science Education Consortium, Inc.
Boulder, Colorado

1985

ORDERING INFORMATION

This publication is available from:

Social Science Education Consortium, Inc.
855 Broadway
Boulder, Colorado 80302

ISBN 0-89994-301-2

Sixteen of the papers were made available earlier, unedited, in microfiche form. This collection, The New Information Technology, can be ordered from the Social Science Education Consortium (order no. 285-7) at $10 plus $2 postage and handling ($1 if mailed to library or school address).

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FOREWORD

Following the lively and controversial conference on which this volume is based, Mary Hepburn, Professor of Social Science Education, University of Georgia, undertook the considerable task of gathering and editing the papers presented at the conference. The papers speak eloquently to the hopes of some for great improvements in education through technology, particularly computers, and the fears of others that computers and other mechanical and technical devices may damage or negate the human aspects of education.

Irving Morrissett
Executive Director, Social Science
Education Consortium, Inc.

PREFACE

The theme of the 20th annual conference of the Social Science Education Consortium, held in June, 1983, was "The New Information Technology: Educational Implications and Social Issues." Members of the Consortium were joined by colleagues from universities and education agencies from several European nations in a four-day discussion of the effects of electronic information technology on social studies education. Microcomputers received most of the attention (followed by satellite telecommunications) as the group examined implications for student learning styles, student knowledge and attitudes, teacher education, and the content of history and social science courses.

The SSEC conference was hosted by the Carl Vinson Institute of Government and the Department of Social Science Education of the University of Georgia and held in the Georgia Center for Continuing Education June 8-11. Social Issues Resource Series, Inc. and the Vinson Institute of Government contributed grants to foreign visitors participating in the conference.

Selected papers from the sessions were revised and edited for inclusion in this volume. Contributing authors are from West Germany, the United Kingdom, France, the Netherlands, and the United States. The editor thanks all of the authors for their contributions to the book, and William Langeveld for permission to use his cartoons, many of which were drawn at the conference.

Mary A. Hepburn
Editor

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Mary A. Hepburn is Professor of Social Science Education and researcher in the Citizen Education Program of the Institute of Government, University of Georgia. Her studies at Drew University, University of Iowa, and Florida State University (Ph.D. 1969) were in political science and social studies. She has published numerous articles on political/citizenship education and several books including Democratic Education in Schools and Classrooms (NCSS, 1983). A member of the Education Task Force of Project '87 and the Citizenship Education Committee of the National Council for the Social Studies, she is a past President of the Board of Directors of the Social Science Education Consortium.

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Burghard Vilmar is Secretary in the Ministry of Education and Cultural Affairs, a position which he has held since December 1978. Dr. Vilmar studies law, political science, and modern languages at Frankfurt, Bonn, and Paris. From 1966 to 1974 he was county commissioner at Marburg and he served as Regierungsprasident at Kassel from 1975 to 1978.

Michael Vorbeck is the Head of the Section for Educational Research and Documentation where he has worked since 1968. Included in the Section is the Documentation Centre for Education i. Europe which contains over 18,000 books, some 300 periodicals, and many reports and other documents considered "grey literature." He holds a degree in law and administration and is a senior official in the Bavarian Ministry of Education.

NEW TECHNOLOGY: SERVANT OR MASTER OF SOCIAL SCIENCE EDUCATION?

Roger Homan
Brighton Polytechnic, United Kingdom

Introduction

In a recent letter to The Times (29 March 1983) the Chief Education Officer of Sheffield dismissed the opponents of microtechnology across the curriculum as 'a few unregenerate, Bourbon-like defenders of a lopsided and inadequate view of culture': this paper is an apology on their behalf.

Unregenerate they may be but few in number they are not. It is still the case in Britain that computing skills are confined to a narrow range of curriculum subjects, within which social studies and political education barely feature. According to an enquiry conducted in March 1980 'very few primary schools in England had the use of a microcomputer and these schools were scattered throughout the country' (Jones 1980: 61). And a survey carried out last summer by the School Broadcasting Council showed that in schools for children ages 11 or 12 and above 94% of mathematics and computing science departments, 23% of geography departments and 10% of economics departments had staff competent to use a microcomputer but in other subjects the figures were negligible (Hodges 1983).

The campaign to install the new technology in schools has been an initiative from the central government, and the measure of public finance appropriated to it has been calculated to overcome the whims and expenditure preferences of the Bourbons. In October 1982 the Department of Industry - not the Department of Education, be it noted - launched a £9 million scheme to put a micro-computer in every primary school in the country. Under a similar scheme costed at £3 millions, half-price hardware had already been provided in 5,500 secondary schools. The Micro-electronics Education Programme of the Department of Education and Science is funded to the extent of £9 millions over a three-year period, and the Inner London Education

Authority, serving only schools in central London, has a £2.1 million scheme to expand computer education which has been running since 1981 (O'Connor 1982).

These figures, it has to be said, are high by the standards of educational budgets in Britain, and to them must be added the contributions of schools: the standard arrangement is to offer schools half the cost of provision and this is found to be an effective inducement to purchase; but schools must meet the other half from their domestic budgets and to that extent existing resources are pre-empted.

The State of Social Science Education

It is instructive to review the rationale of social and political education as developed in innocence, as it were, of the potential contribution of the new technology. It is not feasible to do this as an objective survey of currents in content, methods and objectives but it is possible and useful to take the odd sounding here and there in order to identify trends.

The notion of literacy and, in particular, of political literacy, as conceived by Graeme Moodie and nurtured by Bernard Crick (Crick and Heater, 1977: 179), has been normative in the specification of objectives in recent years. The politically literate student is distinguished by the development of attitudes, informed by knowledge, competent in skills and contrasted with what Crick dismissively calls 'punch-card and data men'. The concept of the literate as both informed and motivated recalls Marx's last thesis on Feuerbach:

> The politically literate person must be one who can use his knowledge, or at least see how it could be used and have a proclivity for using it; a pupil should be given opportunities for applying it, or the opportunities that they themselves seize should be analysed and aided. Equally, his or her desire to participate must be informed by as much knowledge of what he or she is going into and of what consequences are likely to follow from actions as is needed to make participation effective. All actions affect others, so he or she must be aware of what effect actions are likely to have, and then also to be able to justify them (Crick and Heater 1977: 179).

A specification of the values and attitudes that are appropriate to education for political literacy is offered by Crick in his paper 'Procedural values in political education' (Crick and Heater, 1977:

113-24) and in Crick and Porter's Political Education and Political Literacy. Further, these were variously enshrined in a Department of Education and Science paper on 'Political Competence' written by Her Majesty's Inspectors R.A.G. Hennessey and J.G. Slater and circulated in 1977. In a democracy, it was suggested, the promise of political competence is the attitude of tolerance, not merely in the sense of passive acceptance but in the positive welcoming of diversity. In the resolution of conflicting interests the HMIs entertained the possible expedients of war, imprisonment and censorship but distinguished the acceptance of compromise as a political attitude appropriate to democratic society. And they commended open-mindedness, recalling the advice of Bertrand Russell:

> When you come to a point of view, maintain it with doubt. This doubt is precious because it suggests an open mind, I do not mean to argue that we should confuse an open mind with an empty mind.

The importance of the open mind has been all pervading in Western educational thought and has affected most measurably the pedagogies of social studies, political education, and religious education. At secondary school level the method of classroom discussion has been normative and its widespread use firmly based on the Piagetian wisdom (misguided though it may be) that abstract thought and the efflorescence of powers of reason are distinctive of the early teens. Much of the agenda of social studies - marriage, the family, work and unemployment, conflict, peace, arms, socialism, disadvantage, race, women, money, for examples - leads itself to lively debate: a lesson directed by discussion is foreclosed when consensus is achieved, and so it is in the teacher's interests to avert agreements.

It is axiomatic that the answer is less interesting than the questions. The word 'problematic' has recently come into currency as an approving description of the approach to subject matter which keeps questions open. If a question is closed, if a problem is framed to allow only one resolution, it is barely worth exploring. What is being deliberately fostered, therefore, is a pluralism of values and beliefs and strategies. It is in this way that the virtue of tolerance works itself out in an increasingly multi-

cultural society. What is expressed as desirable in relations within the community has implications in this way for pedagogy within the classroom. The free and open discussion of social problems maximizes student participation and interaction and satisfies the teacher that he or she has avoided the hazards of bias, indoctrination and heavy socialization.

Further, we operate post-Kierkegaard within a tradition that recognizes the equation of truth and subjectivity. Rights to freedom of thought and expression are not selectively assigned upon proof of reasoned argument. Deep elusive motives, base instincts and palpable prejudice are equally allowable - the political literate is distinguished from the illiterate not by any greater voting power but by the quality of its exercise. For example, loyalty is a powerful if non-rational directive in an election campaign, in a strike or in relationships within a family, and persons in such situations might hold views that are valid for themselves yet contrary to all objective assessments of more general interests.

The objectives of education for the multi-cultural society in Britain are commonly expressed in terms of the enhancement of respect for self and respect for others (James and Jeffcoate 1981: 4). This dimension of individualism and the recognition of its validity have thus come to be particularly important in social and political education. In educational and political objectives, in strategies commended for the management of discussion, in the selection of contents and in the identification of leading questions, much has been derived from the post-war development of religious education, notably that of 'religious studies' as crystallized by Ninian Smart. The approach is phenomenological. Not to ask what is right and what is wrong with Zen and Zoroastrianism but to appreciate the cultures which they serve and engender, and to recognize the implications of creeds for the private and public lives of those who embrace them. And wherever possible it is desirable to let believers speak for themselves for theirs is 'the truth'. Most conspicuously in the development of women's studies, the estate of women has come to be defined principally in the

perceptions of the subjects. No detached account, mindless of the feelings of women or of blacks, would constitute an adequate statement, at least in the present intellectual climate.

The examples of the study of women and of education for the multi-cultural society illustrate a further trend in social studies and political education at school level (that is, below age 18), exemplified still further by such enterprises as peace education, human rights education and development education. In recent years our purpose in social studies has increasingly been assigned to us in pursuit of national expedient and international agreement. Under the 1974 Paris recommendation of UNESCO, educational time is pledged for education for international understanding and co-operation and peace. Even this year, diplomatic initiatives on the nuclear issue and their seeming failure have been accompanied in Britain by a burgeoning of interest in peace education in the spirit of the UNESCO Constitution: since wars begin in the minds of men it is in the minds of men that the foundations of peace must be constructed.

The Inner London Education Authority has sponsored educational programmes designed to promote peace, reduce racism and increase the toleration of homosexuals. To these ends are deployed both the resources and energies of curriculum developers and the arts budget of the Greater London Council. In response to a campaign in schools by the National Front, a political party whose members are preoccupied with race and brandish the insignia of the Nazis, the ILEA formulated an opponent policy and carried this through by the control of texts and special theatre and arts programmes. Never before have political purposes been so explicit in curriculum innovation. The situation in which the conduct of social studies - among other subjects - is directed towards certain officially prescribed ideological commitments contrasts with once fashionable notions of education as free intellectual development and self-fulfilment under the supervision of a teacher in the role of neutral chairperson. It is a far cry from Carlyle's plea, 'Let each become all that he is capable of being'.

Social Studies and The New Technology

The insurgence of the computer in the classroom, it may be observed, has not been directed to the fulfilment of objectives such as these. Rather the computer is introduced to serve other requirements, primarily those of mathematics and the natural sciences, but once installed must justify its cost.

The computing-across-the-curriculum campaign in Britain is no success story. The broad range of school subjects remains untouched. 'Computer studies',a subject in which computers are studied and practised in their own right, their languages are learnt, but their wider applications across the curriculum are unexplored, is an increasingly popular subject at the level of public examinations. Entries rose by 18,000 in 1981 to 52,000 (O'Connor 1982), but it is an introversionist sectarian phenomenon. Teachers of mathematics constitute a majority among converts to the new technology, followed by geographers for whose increasing preoccupations with quantitative methods the computer is a welcome servant. The much noticed work of Alan Maddison (1982) also adumbrates uses in experimental science, economics, design and technology, history, English, second language learning, art, music, commercial studies, physical education, domestic studies and special education (in America, exceptional education). In each of these applications are speculated rather than reported from widespread practice. On social studies, political education, multicultural education and world studies, however, Maddison draws a blank.

In what few applications of the micro-computer to social studies and related subjects there have been, these components appear to suffer several effects by adaptation of subject matter and objectives to the method of computer assisted learning.

First, in the very representation of social studies there are distortions in definition and omissions from the agenda. For example, we are told:

> Sociology is the study of society at all levels, implying that it is the study of people and their social relationships. Sociologists study sets of related elements organised to some social purpose. At one extreme some of them study the set of related elements organised to form a nation state; at another extreme some sociologists study the set of related elements

> organised to form a conversation between two people. A key idea in sociology is that of system, though it appears in many variants, and it is the idea of system which means that the use of computers in sociology can be so powerful (Allan 1981: 33).

The computer's-eye view of sociology is, to borrow words quoted in the opening paragraph of this paper, 'lopsided and inadequate.' The computer people are highly selective of sociological perspectives in order to find a place for what they regard as their contribution. Seminal though the ideas of system and organization may be, there are several concerns of contemporary sociology which Dr. Allan's tendentious definition fails to make explicit: it does not allow the study of social change, for example, and it neglects the places of conflict, ideology and consciousness. It does not point us to the various functions of social disorganization, nor to socio-psychological conditions such as anomie; and ethical considerations in matters of value are usurped by decisions made on pragmatic grounds. That which is teachable by computers or comprehensible by their operators is defined as the business of the subject while that which cannot be so studied is rejected. The criterion of selection is not an educational consideration or one emanating from the epistemology of the subject but the principle of the scope for deploying the new technology. Within political education, the effect is to magnify the study of voting behaviour which can be easily quantified, and, by implication, to give less time to political ideas, policies and personalities (Stuart 1980).

Second, there is a shift from affective to cognitive objectives. The development of attitudes and commitments which feature prominently in recent conventional specifications of social studies gives way to activities centred on information retrieval, data analysis and the testing of hypotheses. The definition of subject as data is exemplified in the writings of Roddy Stuart who shares the awe of many that 'the computer can store and access vast amounts of data on magnetic tape or disc' (1980: 67). The trend to the cognitive is illustrated too in the leading work of Alistair Ross who has developed and practised in primary schools social studies programmes in which the children design and conduct questionnaire-interviews on such themes as

adult work, code responses and test hypotheses on data collected (Ross 1982b: 7). These are enterprising programmes, not least because of the apparently high intellectual and responsible levels at which young children are enabled to operate. What is not afforded, however, is the kind of empathic understanding of individuals and social groups, of behaviour in roles, and of conflicts between roles and disparate interests that is afforded by non-technological innovative methods such as theatre-in-education (Homan 1978). For it was in the world of feelings that until recently were to be found some of the most interesting departures in social studies.

Third, it would seem that data are losing their human significance and are becoming mere fodder for the new technology. Children of a London primary school find themselves working with census data not because of the intrinsic interest of demography but because the information lends itself to computerization (Ross 1982a). In a paper purporting to be written by children at a school in County Antrim, yet another history project is reported to have been assisted by the computer, and, again, the objects of interest are quantifiable census data:

> Our objective is to make full use of historical primary sources of information using a computerised system. The source with which we are concerned is the census return. It has the potential to be computerised because most information on the census return is sufficiently standardised and such information is available nationwide and in many other countries (sic) for many years in which census enumerations took place. We believe that census returns are a valuable source of information for the historian. There is a great need, however, for such vast stores of information to be made readily accessible and in a form which is intelligible and so suited for detailed research if it is to be of use (Ballyclare 1981: 35).

This report, curiously, goes on to tell us nothing of historical interest: that the statistics being played with were generated in 1901 is incidental to the operation, its main apparent purpose being to legitimize the computer as an educational asset.

Fourth, there is a shift toward occupying children or students in live research, particularly in survey work that produces quantitative data and in the deployment of the experimental methods of the natural sciences in the framing and testing of hypotheses. One of

the elements of social studies in the primary school, it is said, is 'a concern with the processes of understanding and evaluating evidence, of making and testing hypotheses, and recognizing the tentative nature of conclusions about how a society works' (Ross 1982b: 4).

Fifth, as previously mentioned, there is a measure in which the funds available for teaching resources within the school are pre-empted by investment in the new technology. In both national and domestic budgets, the cost of hardware has reduced the funds available for conventional resources such as film, video, books, newspapers and visits.

The expectation of the advent of computers in the classroom was officially optimistic:

> Education can be enriched by the opening up of fields into which, owing to the limitations of the human brain, we have not previously been able to penetrate very far; the use of appropriate computer programmes will enable pupils to attempt tasks they could not before (Consultative Committee on the Curriculum 1972: 9).

In social studies at least, the computer has not been an enabling or enriching innovation. Sights have been blinkered, questions closed, definitions of content distorted in deference to a new technology that aspires to master rather than serve political and social science education and related subjects at school level.

The Computer Lobby and Educational Research

It is submitted, therefore, that the effects of the new technology are not conducive to the purposes of social science and political education. Nonetheless, the campaign to install microcomputers in schools and the pressures to have them used continue. The odds are heavily loaded in favour of the expansion of the new technology in education and it is instructive to survey the strategies deployed, for they are highly sophisticated and teachers are perhaps not competent to withstand them.

The current themes of the computer's public relations agencies are that it is misunderstood and that it is benign. In respect of the first, the computer cannot make mistakes, it is only dependent on what it is told, we are asked to believe that it has no power of its own, it is designed to complement rather than subvert time-

honoured teaching methods and will liberate the teacher for greater contact with individual learners. In respect of the second, computer assisted learning has been purposively explored in certain educational assignments with a powerful emotional factor: computers help the handicapped, the blind (Gill 1982), and the severely educationally sub-normal (Cutts et. al. 1979). They can teach little children to cross the road and stay alive (Alexander 1983). They are useful in the training of nurses (Hicks and Hunka 1972: 4), and they reduce the perennial chore of school timetabling (Dowsland and Lim 1982). The benign character of the computer is signified by the connotations of various acronyms and terms such as PET, APPLE, Turtle, software and, most notable of all, 'chips', which has a special meaning for children in Britain where it is a synonym for French fries. There are endeavours to cultivate a friendly style in the language and behaviour of computers (Taylor-Byrne 1981) and exercises like the game 'Hunt the thimble' are specially developed to facilitate familiarization with new technology in a "fun" situation (Jones 1982: 59).

The economic and professional dimensions of the campaign are still more independent of educational considerations. When micro-computing is commended by chief education officers as essential for 'the country's future economic effectiveness' (Harrison 1983) and inducements to purchase are made by central government, headteachers are quick to respond, if only to put their schools on the map and curry favour by subscription to current orthodoxies. Once installed, the expense of the micro-computer must be justified by extensive use. It is therefore not the case that computers stand ready to serve the Bourbons, but, that the Bourbons are inveigled to legitimize the presence of the computer.

Furthermore, what passes as evaluative research on the uses of the new technology is highly suspect, either because of its sponsorship or because it is confined within narrow terms of reference that are determined to preclude unfavourable assessments. The periodicals Computing Education, Computer Education, Educational Computing and Micro-scope are saturated with case studies of successful practice, invariably reported by the practitioners

themselves. No self-respecting social science journal would allow such incestuousness, but here teachers and student teachers write complacently of their own practice, as though to fortify the faithful with endless testimonies. They introduce new technology to the classroom and persistently interpret the novelty factor as positive student interest. Three college students who used computers with mentally handicapped children report that 'the machines were able to hold the children's attention for longer than conventional classroom techniques' (Cutts, Hartnoll and Moody 1979). Two researchers at my own institution conclude that 'broadcast telesoftware has proved valuable as an educational aid, as the regret felt by the schools in losing it (at the end of the project) has revealed' (Mapp and Raggett 1982: 35). They all demonstrate a deplorably low level of critical interpretation, the latter perceiving possessiveness as educational value.

Why, then, are educational researchers who study the uses of the new technology exempted from the standards of scientific rigour that are expected of their peers? The answer is partly one of economics and may be understood in terms of the patronage of research by agencies with interests vested in the market. The Telesoftware and Education Project which was conducted at Brighton Polytechnic as a joint enterprise of the British Broadcasting Corporation and Independent Television with equipment supplied by Mullard Ltd. is a case in point. The aims of the project were to assess the potential of telesoftware in education, to create and test telesoftware programmes for schools and to evaluate the uses of telesoftware in specific curriculum contexts.

The possibility of telesoftware being found to be educationally unhelpful was remote from the outset. There was, for example, no prior appreciation of the rationales of the curriculum subjects served and no facility for measuring the effects upon these, positive or negative, of the innovation of telesoftware. The broad assumptions that access to information could only be good for the purpose of teaching and that educational merit would be indicated by the satisfaction of customers, be they children or teachers, were never called into question. At the end of the project the

researchers listed a number of concluding statements, principally of a technical kind, on the basis of which telesoftware was found to be proven:

> One can say...that broadcast telesoftware has been shown to be reliable, practical, attractive to users and meeting real needs. It is now up to educationalists and those in schools to decide how to use this new medium (Mapp and Raggett 1982: 50).

So it was not on the basis of educational worth but on technical merits that telesoftware was validated. Fundamental educational questions were not asked in the research that granted the medium a favourable verdict and on the basis of which telesoftware is now acclaimed as 'an important educational aid' (Yeates 1982: 3).

Conclusions

The effects of the new technology upon social science and political education are more fundamental and less enhancing than the liberation of the teacher to teach and the learner to learn. There are marked shifts in objectives and contents from affective and qualitative to cognitive and quantitative. The new technology stands to inhibit some of the positive developments in these school subjects that have been practised in recent years.

The introduction of new technology across the curriculum in British schools is an initiative premised not upon educational considerations but upon economic perceptions; it is a campaign sponsored outside the world of education and market interests are dominant.

What purports to be research on the educational uses of the new technology warrants close and critical attention: it lacks intellectual rigour and is seldom conducted on an independent basis or in respect of fundamental questions.

Perhaps most serious of all, the new technology bears into the classroom a pedagogy which is outdated in social science education: the pretence of omniscience on the part of the microcomputer and its capacity to supply answers to questions are not steps forward in teaching and learning but steps backward.

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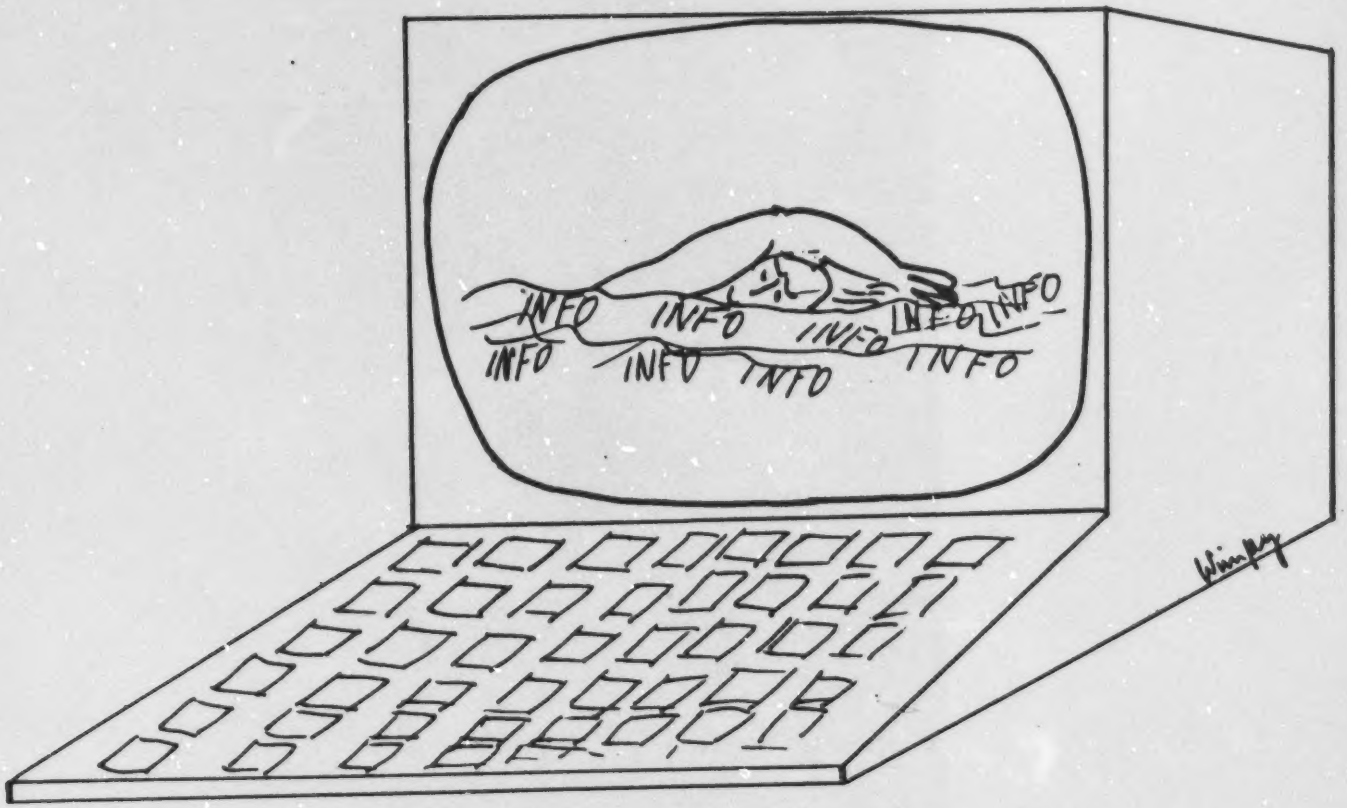
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THE NEW INFORMATION TECHNOLOGY: CRITICAL QUESTIONS FOR SOCIAL SCIENCE EDUCATORS

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As social scientists and educators we cannot help but marvel at the metamorphosis taking place in our work environment. We are in the midst of an information revolution. Microcomputers, which have become widely available in only the last 5-6 years, are now accessible as powerful and reliable tools for the computation and storage of vast amounts of data. Moreover, they are relatively portable and inexpensive. They make the huge mainframe computers of my graduate student research years look as outsized and cumbersome as the giant at the top of Jack's beanstalk.

Videodiscs, cable television and satellite telecommunications are also contributing to the information revolution as it unfolds all around us. Videodiscs, for example, have nearly an unlimited capacity for information storage and reproduction. A single videodisc can contain over 100,000 frames of visuals, and that disc can be reproduced by stamping a copy disc in a fraction of a second. These remarkable advances are changing every facet of our lives including work, recreation, and education.

Change is taking place so rapidly in this electronic revolution, and educators have been inundated with so many questions concerning practical matters of adaptation, that it has been difficult to discern the larger issues for our profession. Much of the response among social studies professionals thus far has been addressed to "how to do it" (e.g., Diem, 1981; Cohen, 1983, Martorella, 1983). Of course, we do need to learn techniques of new information technology. We must obtain basic descriptions and learn practical applications. However, it is more important to us as social science educators that we reflect on the *nature* of the changes taking place

and attempt to determine the implications for individual and collective perceptions of reality. Will the new technology change substantially the way people view the world and each other?

The larger social and professional issues do not emerge readily from the general literature on the new technology. The articles, reports, viewpoints, and early research reviewed by this novice suggest that the lack of high resolution regarding the big issues may be attributable to the fact that there are three planes of interest which cross each other only now and then.

One is a utilitarian approach to the technology, i.e., what it is, how it works, how to use it. The second is what Europeans refer to as "informatics," which is a more specific applied approach to the technology, i.e., examination of how the technology can be related to specific subject matter. The third, which thus far has very limited development in the social studies literature, is a kind of participant-observer examination and analysis of the new tech lifestyles in schools and elsewhere in the society, i.e., assessments of what computers and telecommunications are doing for us and to us, and how individuals and groups are responding.

It seems to me that all three types of investigation have something to offer us as we set out to reassess purposes and means in the profession and chart directions for the future. Therefore, I will attempt to draw upon these several levels of discussion in raising critical questions to be addressed by social science/social studies educators.

1. <u>How is the revolution in information technology changing the schools and education, especially social studies education</u>?

Education generally deals in information and information skills. The school traditionally has been the center for a wealth of information sources which were unavailable in the home. Libraries, laboratories, displays, films, maps, and quantities of textbooks made the school a special place for information. But that is rapidly changing. The newer information sources have first become available outside of the schools. Television, utilized only minimally in schools, provides an information source in every home which has gradually shifted the balance. Microcomputers, in use in businesses and in home

recreation years before extensive use in the schools, have tipped the balance. Schools are no longer the centers of information.

Perceptions of schools and education are changing. Children now have direct sources of information in television sets and microcomputers; they are not so dependent on the teacher. Parental and public confidence in schools is declining. The recent report of the National Commission on Excellence in Education (U.S. Department of Education, 1983) registers a public outcry against declining school achievement scores. The average school graduate of today is reportedly not as well-educated as the average graduate of 24 or even 35 years ago! It is interesting that action called for is not to junk the schools as educational institutions but rather to raise "standards" and reform teaching approaches. Computer applications stand out among the recommended reforms.

In these technological reform efforts social studies educators can help to meet several student needs. One is in the area of "training"--training youngsters in the skills needed to organize, utilize, and evaluate the great wealth of information available to them. The technology, if used creatively, can provide an effective means to move away from narrow facts-memorization teaching. Another need is to avert personal isolation from electronic education by providing opportunities to practice group decisions and examine group values. Still another challenge for social studies educators is in the need for counter-balancing the simplistic or stereotyped realities conveyed on television and in electronic games which tend to "homogenize" childhood (Johnson, 1981).

So what is new in these challenges? Haven't these been among the objectives of social studies education for many years? We should not be misled by their familiar ring, because the situation in schools and universities is changing. The communications style of education is being imposed from without not within. The technological advances which are now engulfing all levels of education are rapidly changing the ways in which we do research, the ways in which we design and teach our courses, and the ways in which we must serve social studies education in the schools. The electronic revolution, therefore, is raising a whole raft of practical where-to-use-it and how-to-do-it

questions for social studies educators. To enrich and update the curriculum and to invigorate and revise methods of instruction today we must work with programmers, business firms, technicians, and systems developers.

As we assess professional obligations, however, we must not overlook the larger significance of the electronic revolution to us as social studies educators. Technological change is creating social, economic, and political issues as it is making history. In short, the content of social science and history which is the subject matter of the social studies, is being amended and extended. Just a few examples: Employment patterns are changing with declines in heavy manufacturing and agriculture and increases in information occupations; Institutional power hierarchies are shifting as exemplified by the rise of systems analysts in business and higher education; The huge world markets for electronic equipment have become highly competitive and fragmented, and related international hostilities have developed; serious needs are arising for governmental protection and regulation with regard to rights related to issues of information privacy and software ethics.

2. How great are the inequities created by initial distribution patterns and how can equal access be promoted?

In the U.S. the older information technology, namely radio and one-way television, obtained wide distribution across social and economic lines. What about the new technology? In the area of interactive satellite telecommunications the question of costs still looms large. Naisbitt, in his book Megatrends (1981), for example, dismisses interactive satellite technology as too costly for mass application and mass availability in the near future. Computers, thus far, are providing an information resource mainly for upper and middle class homes and well-heeled school districts without budget problems. In fact, participants at a 1982 conference sponsored by the National Institute of Education identified "equal access regardless of economic status" as the single most important issue of information technology in schools (Deck, 1982).

Declining costs in computer production and the rising priority given to computers in school budgets suggest that availability will

increase rapidly in the near future. We should keep in mind, however, that effective use of newer information sources requires an active rather than a passive user. Unlike television and radio as we now use them by pushing a button and sitting back to passively observe and listen, the more recent technology requires responses and some skills on the part of the user. *Accessibility*, therefore, is based not only on hardware distribution but on knowledge and training for effective use.

Interlinkage of computers to television and to satellites has brought about a communications revolution of international dimensions and raised issues of accessibility on an international scope. Equal access is emerging as one of the major political and social questions of international governance. Article 19 of the Declaration of Human Rights adopted by the United Nations states that everyone has the right to seek, receive, and send information and ideas through all types of media. In recent years in the U.N., developing countries have expressed resentment at the manner in which they have been flooded with news and advertising from the larger industrialized nations. They seek an equal capacity to disseminate information (Powers, 1980).

Overall, given the interest in the accessibility of hardware and skills it seems likely that in the next few years the schools will be called upon to examine existing inequities and assist in reducing them by providing equal opportunities for learning the skills and applications of innovative technology. This is not a new obligation for schools and educators in democratic countries, but it is not an easy one to fulfill. As social educators in a democracy we must be concerned about open access to knowledge resources. How we approach the question of equal access will require important decisions in national and local political arenas and in the profession soon.

3. <u>As the new technology becomes integral to instruction in the classroom, how are student learning processes affected</u>?

School learning is shifting from an overwhelming dependence on learning from print resources to more and more use of electronic resources. Video screens have brought about some change in learning processes in the last few decades, but mostly outside of schools.

Today microcomputers and videodiscs promise highly accelerated change in the ways in which students learn both in schools and out.

Educational psychologist Mary Alice White (1982) has done some pioneering work in the analysis of electronic learning which can be enlightening to us in social studies education. She has defined three stages of electronic learning: 1) the television stage which began in the 1940s, 2) the computer stage which we have recently entered, and 3) the stage of "the complete electronic learning center" which she predicts is "just around the corner."

White decries the missed opportunities by psychologists during the television stage. Making assumptions that the only learning worthwhile was print based, psychologists dismissed television as a frivolous waste of time and failed to study throughout the first electronic stage exactly what was being learned and how. She goes on to review basic assumptions of three widely accepted learning theories--reinforcement, developmental, and information-processing theories--and points out that they do not hold up when applied to electronic learning. The research on which these learning theories are founded is based on print learning situations.

White proposes that a theory of electronic learning is needed, and a whole new body of research conducted. Motivation, memory, attention, control, and interaction must be studied anew in the new electronic learning environment. As a beginning point she urges careful comparative studies of electronic and print learning. Then, as a first step she provides an interesting comparison of some characteristics of print learning with two types of electronic learning--*receptive* learning (television, cable) and *interactive* learning (computer, video-disc, interactive cable).

The differences between receptive and interactive electronic learning seem to me to be especially significant for social studies education (See Hepburn, 1978). The interactive modes offer high motivation and attention along with high user control, opportunities to ask questions and respond to questions in decision and gaming formats, and greater relative potential for high image communication. The content of social studies is people-centered, and it is dynamic, continually expanding and changing. Clearly, content which involves

people, issues, and decisions is best taught in an interactive mode. New information technology appears to have the potential to stimulate and increase social studies learning not only by providing freer access to information but also through learning activities which require frequent active utilization of content. The proposition begs for research.

4. In what theoretical context(s) shall we set objectives for redesigning content, materials, and strategies of social studies education as we proceed into the new information era?

Belief and actions regarding social studies depend not only on learning theory but on social and educational philosophies, and the two are not often easily reconciled (See Hunt and Metcalf, 1968). Today we are subjected to a loud clamor from the public arena in which so many education decisions are made. It resounds with calls for action--from government, from business and industry, from academic, from local communities. All demand improved school education in the new technological era. But the voices are not united. The various formulas for improvement reveal differing philosophical perspectives.

Before leaping into "high tech," social scientists and social studies educators should reflect on underlying purposes and implied outcomes. For example, high in the arena a group we might call "modern day essentialists" are demanding that we meet the needs of the new era by strengthening education in the basic traditional subjects. The call is for more rigor in school education to produce greater intellectual skills as evidenced in higher test scores. New information technology is to be used to produce a more efficient knowledge-of-the-basics education. Using the technology, teachers are to demonstrate the means to specific knowledge and thus enrich student retention and access to important factual information. In this view the significance of the technology is that we can use it to better learn and better communicate the observed and measured reality in which we live (e.g., Scandura, 1982).

From another part of the arena come the cheers of another group whom we might call "modern day progressives." They welcome technological development with differing expectations. The call is for a reinvigoration of the problem-solving approach to education with

electronic tools (e.g., Ray, 1982). The new technology is envisaged as a means for teachers to improve conditions for student learning of processes. They foresee that in the future classroom the teacher's role as guide or aide will be enhanced, and the temptation for the teacher to act as a conduit of knowledge will be minimized. In this view the significance of technology is that it provides a more efficient means to test hypotheses and to examine unchallenged truths.

Of course, there are other perspectives. Some view the information revolution as a possible means to social reconstruction. Others foresee a fearful technocracy. A few are calling for new social theories to reconcile changing interests in both materialistic and humanistic advancement (See Hartoonian, 1983).

The unprecedented rapid rate of technological change makes careful reflection difficult. Nevertheless, social studies educators must take time to examine the assumptions and implications of proposed development programs. We must attempt to define the theoretical contexts of the choices we are making as we decide individually and in large professional groups just how we shall respond.

5. How shall we define social studies "computer literacy" and thus the extent to which we will attempt to educate students and teachers to utilize computers in the social studies?

The term "computer literacy" applied to students or teachers is controversial. It is widely used by educators to refer to *some* minimum level of competency of learning about computer applications, but there is little agreement about what the minimum should be. One group of educators uses the term to refer to competency in recognizing and describing the capabilities of computers, their impact on society, and some practical information about their application in work areas. A group of Swedish educators, for example, has experimented with teaching "computer appreciation" in mathematics and civics courses in upper secondary schools. Students develop an awareness of the use of computers in workplaces by reading, discussion, and field trips, and by using the computer to solve math problems (Kollerbauer, 1982).

Other educators argue that "computer literacy" means the ability to actually do computing including programming skills (Kelman, 1982; Calhoun, 1981). Some have suggested that computer software be used

to teach about the nature of computers, and their role in economic and social change. For teachers, instructor-created software could be used to review the effects of computers on the curriculum (Hofmeister, 1982).

Another view is that school computing experience should be provided only for those who are interested, rather than forcing it on every student (or every teacher). It is argued that the demand for universal computer literacy has been based on a false impression of computer education as a means to a good job and social mobility (Harvey, 1983). Given the limited number of computers in each classroom, it is argued, those who are interested and who are progressing should have greater access.

The question of how much social studies teachers and social studies students must know about computers and how skilled they must be in the use of computers is a serious issue in our subject area. Social studies teachers are reported to be "at the bottom of every usage survey." Even those few who utilize computers in social studies instruction, use them mainly for drill and practice or canned simulations rather than teaching social science processes (Roberts, 1982).

We can gain some insight into the usage problem from Western European educators who gathered at a conference in Italy last fall to report and discuss their experiences with computer applications in education (Council for Cultural Cooperation, 1982). All of the reports emphasized the initial need to alleviate teacher fears of the computer. Commentary in U.S. computer journals and in the European reports suggests that once teachers have enough training to feel familiar with the hardware, and are given enough time to experiment, they, like their students, will be caught up in the activeness, challenge, and versatility of the medium (Ray, 1982; Olds, 1983).

We have learned from past innovations in social studies curriculum that the confidence and cooperation of teachers is required for successful application with students. "New Social Studies" materials and more recently citizenship education strategies presented teachers with curriculum materials which were mainly in the age-old non-threatening print medium. The obvious question is: if

success was limited then, how can we expect to successfully innovate using a completely new microelectronic medium?

One response is that we are just finding the appropriate medium for some of the older messages of the social studies curriculum. The more open, interactive, information-fed format of learning based on the new technology can help to promote inquiry and problem solving learning. Debugging can provide some powerful lessons in both logical and critical thinking. Programming requires conceptualizing and a series of hypothesis testing activities. Moreover, today there is a less hostile environment for discovery learning, perhaps because it is in the technological mode. The social, political, and economic climate tends to encourage all types of computer education.

6. How will the revolution in information technology affect human interaction in schools and classroom?

Educators from 12 European nations at the computer technology workshop last fall discussed several concerns about the human effects of computerization in schools (Council for Cultural Cooperation, 1982). One of these was teacher fear of replacement by technology. Another was the threat of replacing teachers with technically trained persons from the business world. Participants determined that teacher replacement was far-fetched. And, although the hiring of teachers with business world experience with computers was encouraged for some vocational programs, proposals and recommendations were built around the assumption that subject area teachers will learn enough about computing through in-service or basic teacher education courses to be able to use the technology as a teaching tool in their subject area. Two important changes in the teacher's role were predicted however: teachers will no longer be the prime source of information, and teachers will develop new skills and will become more professional.

Not too many years ago American teachers could be heard to express concerns about being replaced by computers. Some had conjured up images of a clanking metal robot with flashing lights at the head of the class teaching world history in a droning electronic voice. Now, computers are much less threatening in the U.S. because they are everywhere visible outside the school--in the grocery store checkout, the appliance section of department stores, post offices, travel

agencies, brokerage firms, airline ticket counters, nursing stations in hospitals, and in the living rooms and offices of favorite soap opera characters. Increasingly teachers can be heard expressing impatience at not having a microcomputer exclusively for their own classroom.

One of the human problems about which American sociologists and psychologists have expressed concern is the impersonality of computers. Computers will not adjust to us as people do. They adhere to a specific program. A typical example is the kind of irritation one feels after many years of paying the light bill on time, when on return from a vacation, a short unpleasant letter is found threatening to turn off the power because the payment is three days late. The telltale dot-matrix print in the letter reveals that it was prepared by a computer. But how do you explain your situation to an impersonal, inflexible, and cold machine?

On the other hand, in some situations computers have been found to be more "humane" by reducing embarrassment and putting people more at ease than if they were with a human. Patients in hospitals preferred computer interviews, and alcoholics more honestly reported their alcohol consumption to computers than to sympathetic human interviewers (Calhoun, 1981). Computers do not give us a glance of disapproval or a condescending response--unless programmed to do so. Certain school children may be better motivated to learn in computerized trial-and-error learning modes in which they feel free to make errors without receiving disapproving glances or remarks from teacher and classmates.

Will we lose the opportunities for cooperative learning and group discussion afforded by traditional print-oriented classrooms? White (1982) reported a study conducted at Teachers College in which pupils interacted with each other more in the computer room than in the regular classroom. Moreover, much of the interaction in the computer room was concerned with learning, while in the print-oriented classroom much less of the interaction was productive.

Telecommunications can add another dimension of human sharing to the microcomputer and video screens. Telecommunications make interaction possible between student groups across many miles, across

continents. In addition to exchanging information, they may also exchange expressions of attitudes and feelings. The process could be beneficial for human understanding across regions and across nations.

It seems to me that individualized electronic access to information is likely to have significant effects on the age-old authority structure in the classroom helping to free teachers as well as students. As pointed out earlier, teachers will no longer be considered the "fountains of knowledge." However, electronic tools will provide sources of extensive information and will allow teachers to more effectively teach the skills of logic, clear expression, and critical thinking. A probable outcome is more democratic intergroup communication. A likely side effect is that teachers will improve their own professional status.

Students will have greater direct information access and be less subject to unproductive teacher manipulation. The psychological relationships between teachers and students seem likely to change as they work with electronic data sources in a common purpose. The potential for a more democratic and more productive classroom atmosphere is there.

Overall, there is every indication that electronic learning need not be dehumanizing and can, in fact, promote humanistic and democratic attitudes if programmed properly and used in an open and interactive manner.

Conclusions

In the rush to bring social studies education up to date by bringing the marvels of new electronic information technology to the social studies, we must not lose sight of the overall social context of the changes taking place. As social scientists and historians we must attempt to monitor the social, political, and economic consequences of increased use of the technology in schools and everywhere else. As educators we must examine various possible uses and carefully research the affective, cognitive, and social outcomes.

Technological advancement is a result of human creativity, and it is human factors which will determine use and direction. Social

science educators have not been in the forefront of educational development in the electronic revolution. If we do not become knowledgeable and get involved, the directions of development will be determined outside of the profession.

In professional social studies organizations such as the Social Science Education Consortium, our obligation is to raise pertinent questions and systematically seek answers. Such a review of the changing information technology will require learning its techniques and cooperating with experienced business, research, and technical personnel to develop our skills of application. At the same time we must keep a critical and evaluative distance in an effort to assure that the quality of the programs developed and the results that are produced are appropriate to the goals of social science education in a democratic society.

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I warned you all along Marv, not to spoil him by paying too much attention
LUV
I WANT TO PLAY GAMES!
PET
Wimpy

ALTERNATIVE TEACHING AIDS

Or *WHY WE CAN DO WITHOUT THE NEW TECHNOLOGY IN SOCIAL STUDIES AND POLITICAL EDUCATION*

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In what way can people learn best about society? From the dialogues of Plato to the computerized classrooms of the 20th century is quite a change. Which methods are most effective? Well, Socrates was certainly not the worst teacher, but would Socrates develop software for the big publishing houses? (Or would he gladly leave this task to the sophists?) Since ancient times the major question of all teaching has not changed. What are our aims, and once goals are determined, what are the optimal methods and teaching aids?

Medium and Methods

We must not forget MacLuhan's generalization that the medium is the message. Education is no exception to this rule. As Benjamin (1) asserted, in different historical epochs there prevail different ways of living, which influence the whole way we observe through our senses. Benjamin brilliantly analyzes how the reproductive possibilities of photography and of the printing press changed the process of education even more. The printing press was a *sine qua non* to the bureaucratization of the modern state providing a means for all kinds of minutious regulations to be distributed throughout the nation. But the press, as Ivins (2) makes clear, did more. Exact reproduction of all kinds of images was a necessary condition for the development of science and for scientific instruction. This phenomenon only indirectly touches the role that images can play in education, as Comenius pointed out in his Orbis Pictus. The early 19th century printing techniques,

like the steelgravure and the lithograph, prepared the way for standardization and endless reproduction. While students in the Middle Ages had to study in groups having only one book at their disposal, in the 20th century every child in primary school has books of his/her own and is working individually. This can only be seen as an improvement in comparison with the 19th century school in many countries where a teacher had to rule (and by what means!) over a crowd of 50 to 100 unwilling pupils, with hardly any teaching aids.

The New Information Society

Nowadays information is the lifeblood of governments. A government is only sovereign in proportion to the level on which it collects, analyses, keeps and distributes information. Jacobson (3) sees this sovereignty infringed upon by multinationals like SBS (Satellite Business Systems) a common venture of IBM, Communications Satellite Corp. (Comsat) and Aetna Life and Casualty Insurance Cpy. The combination of satellites and computers has the potential to break through all national information barriers. It is no coincidence that governments everywhere try to monopolize education, where they get a chance to do this. Where they do not have this chance, they put it under strict financial control, both quantitatively and qualitatively. Education is not only fundamental to the disciplinary functions of the state, it also conditions children to ways of receiving and decoding information. Implicitly it leads them to accept certain information and reject others. This process of standardization and homogenization of the senses could start only when printing presses began to do their reproductive work efficiently and cheaply.

As the new developments in satellites and computers change the situation in regards to the information function of governments in general, they will also have far reaching influence in the way of which the content and methods of education will be organized. These new technological developments are propagated by industries whose interests I do not have to explain, and they are welcomed by technocratic administrations desiring to economize on education (4).

Political Education in This Era

If we look at the main trends in political education in the Federal Republic of Germany, the Netherlands and other West European countries we see that the tendency toward critical review of the sixties has almost completely vanished. The German magazine "Betrefft Erziehung" in an editorial (No. 10, 1982, p. 23) states: "We have come so far now, that schoolbook publishers, who produce books for the field of Political Education, have themselves cogently taken over the affair of censorship: in the board of editors and the circles of readers one knows on the basis of bitter experiences, which parts, which materials, which questions could give offense to the gatekeeping authorities". And further ... "to the dynamic field of political education quietness has returned. Truly we mean: the quietness of the cemetery". This is a German example, but the same tendencies have been traceable in the USA for a long time, and in the Reagan administration they are displayed more openly.

It appears that reactionary technocratic governments are promoting the introduction of new gadgets in education not only for reasons of efficiency and economy, but also in order to get a stronger grip on its content. Would the multinationals producing the software make materials for political education that differ ideologically from what is published now in Germany and the USA? For obvious reasons this cannot be expected as these producers have themselves no interest in a critical analysis of power relations in our society.

When I compare schoolbooks for social studies and political education published in the USA, Great Britain, the Netherlands and the FRG (5), I come to the conclusion that hardly a book for social studies in any country can be found that consistently shows society as fundamentally changeable and also gives cues for change. There are few books or teaching aids made for the purpose of showing alternatives for given social and political situations. The more progressive authors may sometimes prudently quote a well known philosopher who has launched some revolutionary ideas or offered questions for discussion. Books with criticism, which make students doubt aspects of their own society, do not sell and publishers do

not print them, because teachers do not agree with the material or they are afraid of trouble with parents. From this perspective I do not see any hope for software that helps the student think in alternative ways that really count.

When we look at international developments we can foresee an educational market that will be as standardized, as is already the case with the marketing of consumer goods. Only what sells best will be produced and there is no doubt about it that this will have the least controversial content we can think of. We can predict that we will have a highly advanced technology working with most mediocre kinds of programmes and software, if we look at it from a socially creative and politically imaginative viewpoint.

The Media

For several decades television has been providing enormous reinforcement to this process of conformity to the existing order. Although we are far from having a detailed insight into the short and longterm effects of TV, we may say that it certainly does not attempt to make people critical of their own society and of the various vested interests on which it rests. People have access to a flood of information through television, or so it seems, as closer analysis shows the limitations and one-sidedness of all this material. It is no new assertion to say that schools are no longer the major public educational institute, but that the mass media are at least as important, certainly in the field of social studies and political education.

Considering the second and third-hand worlds that come to us through these mass media channels, the possibilities for manipulation of information and consumers are numerous. These media shape the masses, whose needs they fulfill by giving them what they are conditioned to ask for.

The Response in Education

How has education reacted to these technological and information processing developments? So far, and speaking generally, educators have not really resisted or redressed their influence. Instead they have tried to compete with them by introducing the

same technological aids, sometimes - but this is an exception - with software that really offers critical analysis of social issues.

Education has latently fostered the use of these media by students, reinforced the authority of the media and conditioned the students' senses to the screen. It goes without saying that education has also come under pressure from the big industries to buy their products. But it is all too easy to lay all the blame on the doorstep of big business. First of all, education as a social institution is part of society and it is as sensitive to trends as any other sector, although perhaps somewhat more conservative, following social change at a distance.

Education hardly ever initiates social change, being far more a product of society than an autonomous factor in it. Here we find the main cause for why education has never defined its own character ethically, pedagogically and didactically. Regarding the transfer of knowledge, it has more or less automatically followed what the state and society asked for, (or rather, what the prevailing interests required) and what technology had to offer. With only limited hesitation, it must be admitted, education has integrated radio, film and TV.

So far it is true that the use of these technological aids has not changed the process of education fundamentally. The teacher has remained in the center of this process, whether using film, TV or radio. Perhaps she did not exhaust all the different aspects of the new aids, and she was sometimes criticised for that. She was looking for the more positive side of these things: where they could be a help in an otherwise dull or abstract lesson. But the class was kept intact, using very traditional means of transfer, such as lecture teaching, testing and discussing. Unconsciously perhaps, she was countering the manipulative forces of the media in the simple interactions between teacher and class.

Research in several countries (6) shows that teachers spend 60 to 70 percent of the day talking to students. Of a six-hours elementary schoolday 126 minutes are spent on instruction, less than one minute a day is occupied in providing interactive trials with, and feedback to, individual students. These figures are used by

advocates of computers for introducing them. For example, Papert (7) wants a computer in the hands of every child. According to him, the computer will correct children's mistakes and through the use of 'logo' they will "learn how to learn" everything else. The personal computer would bring about creative mental doodling and experimentation. The computer can give feedback that the teacher never will be able to, mainly due to lack of time.

The same figures on teacher talk can, however, also be used in a plea to ban computers from the classroom. The teacher has a special place in classroom setting. She brings her own personality into the classroom with all its idiosyncrasies and can give her own opinion. Of course she has had increasing difficulty doing this with the advent of films and TV-programs, as these have an authority with which she cannot compete. The teacher has become more and more dependent on authoritative sources. She has almost forgotten how to give children an example of what it means to think, to value, to have a viewpoint of your own based on reasoning. Nevertheless, education has still kept its main tradition intact: personal contact between teacher and child remains the major educative factor. All the pieces of apparatus could not do away with the personal interaction between students and teacher as the factor determining classroom atmosphere.

The new computers, however, are a real threat to this tradition. The child can be seen at home completely lost in his screen, playing all kinds of games, isolated from the family. After the automobile took away children's playgrounds in the cities, TV put what remained of children's games into oblivion. The next logical step in this sequence is that the computer screen not only at home, but also in the schoolroom, threatens to replace parents and teachers in their instructive functions.

Looking To The Future

The computer will be much more destructive to school education than all the other gadgets, because it will isolate the individual child still further. The socialising functions of the old children's games seem to be completely forgotten. Yet by playing them children learned about cooperation, how to be a good sport, and all kinds of

social behaviour. Games stimulate fantasy and creativity. In the old-fashioned school class (the main function of which was, as now, disciplining the students) children developed an anti-school culture of their own. By doing this, they got a compensatory training in defending their self-respect by mutual help, that can be of great use in later life.

When the computer is sufficiently developed, it seems likely that the child will need no teacher, because the screen will help him out in every respect. Programs are not yet elaborate enough, but as they are perfected, it will be possible. Already the computer supplies answers and solutions to almost every question asked. The child can help himself, as the promoters of 'logo' tell us enthusiastically. But was this what pedagogues like Montessori and Dewey who proposed more autonomous learning had in mind?

It is true that prophesies made by inventors have not yet come true. Edison (8) said in 1913: "Books will soon be obsolete in the schools. It is possible to teach every branch of human knowledge with the motion picture. Our school system will be completely changed in ten years". And Kurtz (9) more or less repeated this statement in 1933 as regards television: "This new instrumentality (television) bids fair to become the most potent agency for universal education ever conceived. For, in due time, every home will have its own classroom, with professor, blackboard, diagrams, pictures, and students".

Well we know better now, but this does not mean that history will repeat itself. Although, authors like Sharkan and Goodman (10) try to reassure us by saying: "Technology may revolutionize education only on the premise that it will enable us to do a better job of teaching. Machines can only help people do a better job; witness the industrial revolution." They write this at the very time that the estern world is confronted with mass unemployment!

The problem is that certain jobs are done better without people, and we can only guess about the reaction of all those youngsters who have hardly any work future. As in society, the problem in education will be that once we have installed the computer in the classroom we will not be able to get it out. It is not an

auxiliary like film or TV. But the trouble is, the computer replaces the teacher. Her role will be compensatory, with all the loss of contact that this implies.

For social studies the computer seems to be the final straw, as there is hardly a place for the study of real alternatives in textbooks and programs produced by multinationals. Theoretically, there are enormous possibilities imaginable, but that goes only for the more advanced programs. In intricate simulations alternative social systems could be tested, but this requires extensive knowledge and insight into social and political structures that students do not already possess. So these programs will not be the common type in schools.

Assessing The Effects

The fundamental question is whether education should accept, after the usual objections are made, the penetration of new gadgets in the field of social studies. The choice should be made after balancing all the pro's and con's of computers in education. Consider the following:

1. A positive factor is the saving of time spent on rote learning as we see in arithmetic, topography etc. Although I find it a loss that children can hardly calculate by heart anymore, this time reduction factor has a minimal function in social studies, if we intend to teach thinking in alternatives about complicated social and political problems.
2. On the positive side is that all kinds of information are within reach of students. Encyclopedias, libraries, files can be consulted and this is a real asset to social studies, where it has always been one of the major problems to get students to collect information.
3. A third advantage is that simulation of complicated social and political problems is possible, but I have my doubts as to their present application in high schools.
4. An interesting point is the use that has to be made of computers in the so called 'civil informatica', lessons

about the consequences for society of the introduction of the computer, lessons that fit very well in social studies.

5. On the negative side of the balance we find some heavy weighing factors. First of all the new materials will be complete to the effect that the teacher has no chance to intervene. The program will go its own way step by step, and there is no sidetracking possible. What we can appreciate is the logical consistency of this method, because it contains a lot of formal learning. However, as far as social studies are concerned this point is only partly of interest. For social studies we need a holistic approach that leaves room for speculation, creative ideas, brainstorming and free associative thinking.

Tyrell (11) used the terms 'divergent' and 'convergent' to distinguish problems which cannot be solved by logical reasoning from those that can. Convergent problems are the highlights of man's intelligence, they are the result of abstract thinking. When they have been solved, the solution can be used by others who would not have to go through the whole thinking process again. The way of thinking that leads to these solutions can easily be programmed in a computer as well as the results.

This is not the case with divergent problems, that are only partly solved by living them. Where human relations come in we are dealing with divergent problems, which cannot be handled in a mechanistic way. They require feeling, understanding, intuition, love and ethical values. It is as Schumacher (12) put forward:

> The true problems of living - in politics, economics, education, marriage, etc. - are always problems of overcoming or reconciling opposites. They are divergent problems and have no solution in the ordinary sense of the word. They demand of man not merely the employment of his reasoning powers but the commitment of his whole personality. Naturally, spurious solutions, by way of clever formulae, are always being put forward; but they never work for long, because they invariably neglect one of two opposites and thus lose the very quality of human life.

By introducing the computer in social studies we may lose much more than arithmetic lost when the pocket calculator took over. We might lose the whole idea that social and human problems are very difficult to solve in a human way. A computerized society will in general show a reduction of human interaction, because many production situations will no longer need people and the same goes for consumer situations.

Although the computer teaches logical thinking, it simultaneously creates an attitude that longs for easy, mechanical solutions to complicated problems. This is a mentality that we recognize very well and that has existed a very long time. The Nazi government was not brought about by a computerised society, but by a highly industrialised one. The general application of computers will not only reinforce forces at work in an industrialised world, it can even change them in a more negative direction, by taking away the creative capacities of many people, making them extensions of these apparati and having them think in line with the programmes they are conditioned to.

This whole process is fostered by the isolation of the individual who is alone with his computer which will be his library, bookkeeper, recipebook and advisor in many questions. This seems positive to us now, but we easily forget all the loneliness that goes with it. Who will dare to ask his neighbour for advice, if he can get this on his screen?

Conclusion

In my opinion then, social studies should use computers only very cautiously. They should be used for the collection of data and for lessons in 'civil informatica.' But that subject should also be treated very carefully. The mythology about computers has reached gigantic proportions. Science fiction is only one example. What we need in fact is a kind of anti-computer program that shows us the hard facts of a computerised society and its dangers to civil liberties and human dignity. Programs like that have to be made by individual teachers or groups of teachers, perhaps with the help of progressive scientists and informatica experts.

What this world needs is creative thinking in real alternatives for the political-economic systems that divide the world today, that exhaust themselves and natural resources in a useless arms race, that pollute the environment and exploit the Third World. Children should learn to develop in themselves what the computer cannot do, that is to think horizontally, to bring a piece of thinking from one sector, to reflect and wage a new idea, that need not necessarily be realistic but that can stimulate the thinking and inventing of someone else. I am not arguing that there should be no discipline in the thinking of students: what I am saying is, that the more computers enter other subjects, in social studies we should give as much counterweight as we can, only making use of them where we cannot avoid them and where they are useful because they save time and energy.

Notes

1. Walter Benjamin (1936), Das Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit, Frankfurt, Suhrkamp, 1977.

2. William M. Ivins, Jr. (1953), Prints and Visual Communication, Cambridge (Mass.) & London, The MIT Press, 1980.

3. Robert E. Jacobson (1979), Satellite Business Systems and the concept of the dispersed Enterprise: an end to national sovereignty? Media, Culture and Society, 1:3.

4. An extra argument is the decreasing financial support for the schools in the era of Reagonomics: "... technology offers one of the panaceas to increase college board scores; improve reading, math, and language skills; reduce the proliferation of nonpublic schools; mollify advocates of the voucher system..." William Sharkan and John E. Goodman (1982). Improving the Climate for Educational Technology, Instructional Innovator 27:5, p. 13.

5. Schoolbook research done in different countries come to conclusions comparable to my own. Compare: Magnus Haavelsrud (1980), Indoctrination or Politicization through Textbook Content, International Journal of Political Education, 3:1, p. 67-84;
Karl-Ernst Jeismann (1982), Internationale Schulbuchforschung: Aufgaben, Arbeitsweise und Probleme, Aus Politik und Zeit Geschichte, 32:36, p. 27-37;
Gerd Stein, ed. (1979), Schulbuch-Schelte als Politikum und Herausfordering wissenschaftlicher Schulbucharbeit, Klett-Cotta, Stuttgart;
Gerd Stein (1979), Immer Ärger mit den Schulbüchern, Metzler, Stuttgard;
Bernhard Tewes, ed. (1979), Schulbuch und Politik, Schöningh; Paderborn, München, Wien, Zürich.

6. Instructional Innovator 27:5, 1982, p. 29.

7. Seymour Papert (1980), Mindstorms: Children, Computers and Powerful Ideas, Basic Books.

8. Thomas Edison (1913), Interview on Future of Moving Pictures, New York Times, July 13, sec. 3, p. 8.

9. E.B. Kurtz (1933), Interview on Television's Future, New York Times, Jan. 17, sec. 9, p. 4.

10. Ibid.

11. G.N.M. Tyrell (1930), Grades of Significance, London.

12. E.F. Schumacher (1973), Small is Beautiful, London, Abacus, p. 96 ff.

THE NEW TECHNOLOGY AND SOCIAL-POLITICAL EDUCATION IN WEST GERMANY

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The technological revolution that is taking place in our economic and social system has not been fully understood by a large part of our population. There is a public debate among technicians, economists and politicians about the consequences of these new developments but many people doubt that the scope of the resulting problems have even been understood. And this is even more true of our schools. Curriculum-planners/teachers/students have yet to examine the consequences of new technology in the society.

I would like to illustrate this by two examples not from textbooks but from weekly magazines.

Example: *How Computers May Change the Conditions of Work*
Mr. Kapzig has been working on lathes for 25 years. His work required a lot of moving around, picking up material, etc. which quite often caused aches in his back. Now everything has changed. His machine was exchanged. The new one works on computerized numerical control and does more of the work. Mr. Kapzig's wages have gone up, but so has his weight. The robot works three times as fast as Mr. Kapzig used to do. He is seemingly in a more favorable position: no hard physical work, no moving around, better clothing. But he also feels that this type of work is changing him in a manner previously unknown. He discovers in himself a tendency to isolation. Some years ago he played soccer, but now he is neither physically nor mentally inclined to do physical exercises. He even refuses to talk about his problems.

To work with these programs results in psychic tensions. He becomes afraid and trembles whenever he realizes what possible damages might result if he ever overlooked something, because a crash in such a machine might be very expensive. The new machine guarantees a higher standard of living for the time being. But Mr. Kapzig is afraid of the future when robots might take over or less qualified younger people

would replace him. Even at night he cannot forget the series of computer numbers and he finds it hard to "cut off" (cf Spiegel, Sept.6,82).

Example: *Some Problems of Home-Computers*

Mrs. X is sitting in front of her monitor. She first sends an electronic letter to her friend. Then she checks through the catalogue of a tourist agency and registers for a trip. She completes the typing work as part of her job. Via VIDEO she determines whether the children are asleep. She turns on educational television about the history of art. She reads electronic news. She informs her neighbor that he should turn down his music box. She listens to TV-informations about "what to do to counter loneliness," participates in the electronic search for partners, watches for the fifth time the wedding ceremonies of Prince Charles, opens the front gate for the homecoming dog, asks through TV what dinner she should make on Monday, checks the money in her account, and, before going to bed, calls for religious consolation. The electronic household saves a lot of activity. Mrs. X did not speak a word, did not shake a hand, did not walk one step. She experienced no human interaction whatsoever and thus wasted a complete day of her life (cf Der Gewerkschafter, Zeitschrift der IG-Metall, March 83).

Problems of The New Technology

These two examples show some of the problems of the new technology as they are being discussed in West-Germany. People feel uneasy about what the future is going to be like. Here are some positions:

1) "There may be a technological paradise with information nets around the globe, huge data-collections in administrational centers, robot-plants without workers, and jobs overseen with monitors in the living-room, and play-robots for single children, the lonely, the handicapped and old people." (Frankfurter Rundschau, Feb. 26, 83)

2) "There may be a growing bureaucracy and authoritarian power structures, a far reaching structural unemployment, a tendency to cultural homogenity, and alienation on the job. Information technology does not necessarily lead to more autonomy and self-determination for communities and countries in the Third World, but on the

contrary those centres will be strengthened where the information channels meet." (ibid.)

3) Especially, the threats to union-activities are widely discussed. Part-time work in the living-room with a monitor will give you only small social protection. Thus there is no group which might support your position. People working at home might be used as a means of putting pressure on those in the plant. The computer can control every bit of work that some one does. It is likely that workers can be kept apart so that they do not know the rest of the personnel. (cf FR, Jan. 22, 83)

The political parties in our country view the technological challenges as controversial even though all agree that these changes are necessary for international economic competition and for many chances to improve individual and social life.

The Attitudes of the German Population Towards the New Technology

The transition from the industrial to the information age is for most people in our society still like science fiction. There is a tendency to deny, even to suppress the already known aspects of the new information society. There is no agency in charge of technology assessments in West-Germany. Inventions are being introduced without calculating the consequences. Repairing the damages, saving the remaining humanity - that is left to politicians. There is crisis management but no political planning and exercise of foresight to avoid negative developments.

Empirical studies show that more than 50% of the population know neither the term nor the content of micro-electronics. Of those who know 75% favour the new technology (cf. Wochenschau, Sept./Oct. 1982, p. 162).

In the mass media often it has been claimed that young people in West-Germany have lost their interest in modern technology. One indication for this was seen in the proportionately declining student enrollment in engineering sciences. At present this trend is being changed. The interest of students in mathematics, physics, and chemistry has grown, so that mathematics has become the favourite elective course of 35% of all male high-school students (female

students choose mathematics 19%).

Young German people know more about modern technology than older adults. This might result from their every day contact with technological products such as cars and motorcycles. They operate radios and televisions. Many of them do repair work. Products of micro-electronics such as computers, tele-games, hi-fi-sets, are used by them. The attitudes of young people towards technological products and developments vary according to the educational level. The higher the education and professional achievement, the more skeptical are young people. Students of gymnasium and of the university perceive more social dangers in technological development than workers or administrational employees with less education. Within the last 15 years young people in West-Germany have become more critical about technological changes. Empirical studies give the following figures:

Young German people between 16 and 20 years state that technological development is:

	1966	1976	1981
	%	%	%
more a blessing	83	53	23
partly/partly	8	33	54
more a curse	2	8	19

(Rainer Geissler, Jugend and Technik, Frankfurter Rundschau, April 27, 1983)

Other surveys show a more positive attitude, but all agree that the ambiguity of technology is well known to our youth. The possibilities offered by the new technology are experienced as value conflicts.

Both the problems of self-understanding and the future development of our society constitute political-ideological controversies. Some of them are:

a) Microcomputers may lead to more leisure time - but also to more unemployment,

b) Data processing is necessary for economic survival - but may also be misused for political control. (Example: the planned census and the decision of our Supreme Court),

c) Cable television, which is just being installed in West-Germany, may have severe effects on leisure activities. It may lead to even more inactivity but also to more political participation,

d) Technological development may be used for the well-being of men - but also for the improvement of weapons,

e) Natural resources may be further exploited - but without regard for pollution, etc.

Although some of the problems are not immediately related to the new technologies, many people hope for better solutions as a result of these technological changes (e.g., the use of sun-energy).

Information in Textbooks and Instructional Materials

Viewing present-day textbooks in political education one gets the impression that the authors are not aware of the social-political problems of technological change on a broad scale. Some authors do not mention these problem areas at all. Others offer restricted information.

1) Heinrich Fisch/Hans-Helmuth Knütter, Sozialwissenschaften I, Lehr- und Arbeitsbuch für die Sek. II, Oldenbourg Verlag, Munchen 1980
   - There is one single remark on computerized production (p.280) - nothing else.

2) Willi Frank, Politik heute, Winklers Verlag, Darmstadt, 2nd ed. 1981
   - Only rationalization in relation to unemployment is mentioned (p. 132) - nothing else.

3) Herbert Baumenn/Alfred Sitzmann, Der einzelne und die Gesellschaft, Sozialkunde für Realschulen and Gymnasien. Verlag H. Stam, Köln 1981
   - No information on the new technology at all.

4) Peter J. Schneider/Manfred Zindel, Politik, Lern- und Arbeitsbuch, 5th ed. 1981, Winklers Verlag, Darmstadt 1981
   - Automation, the use of robots and its relationship to unemployment is discussed, nothing else.

5) Wolfgang Hilligen/Walter Gagel/Ursula Buch, Sehen - Beurteilen - Handeln, Hirschgrabenverlag Frankfurt, 1982
   - The use of bureau-computers (p. 138) and data processing (p. 299) are the only topics.

6) Kurt G. Fischer, Gesellschaft und Politik, 6th ed. 1982, Metzler Verlag, Stuttgart.
   - The only topics are new media (p. 24) and computers in plants and bureaus (p. 143).

More progressive are some instructional materials which are available for all teachers. These materials are published periodically and are by far more up to date than most of the text-books.

Some examples:

1) Technologischer Wandel, Wochenschau Sept./Okt. 1982
2) H. Krzykowski, Rationalisierung durch Textcomputer, in: arbeiten und lernen, Nov./Dez. 82
3) M. Hoppe, Zur Entwicklung der Datenverarbeitungstechnik, in: arbeiten und lernen, (März/April 1983)
4) Three examples from:
   Wirtschaft und Unterricht, Informationen für Pädagogen in Schule und Betrieb:
   - Mikroelektronik (Dezember 81)
   - Neue Medien (Mai 82)
   - Industrieroboter (November 82)

One explanation for the existing lack of information about the new technology might be seen in the fact that problems of technological change tend to be treated primarily in 'Polytechnik/Arbeitslehre'. But, unfortunately, many of our students do not have courses in 'Polytechnik/Arbeitslehre'.

Consequences for Education

It is evident that children in West-Germany today learn more about the new technology outside of school than in school.

One example may illustrate this: *Dumb but Fast*

Effective recipes on how to change the children of men into children of computers have already been invented - a generation of people with reduced thinking and feeling. From living rooms, restaurants and bars, the new generation of teachers, tele-games, blow and peep. They do a better job than any man would be able to.

Youngsters are forced to learn what their professional world will demand from them - pushing buttons. People used to monotonous work cannot be diverted by anything alive. People respond to the demanded stress of the machine not with refusal but with more competition. With tele-games you cannot play. They give you the action and you do not know why and how it is given. To win means to take it without thinking. The winner must be "dumb but fast," Forget about your head - that's all. Whoever uses creative phantasy to understand the parts of the game or to develop a strategy for intelligent reaction, this person is a bad player, and will be a bad worker.

Tele-games are perfect. Nearly all of them are apt to play off 'frustration,' the lack of sentiments, the feelings of aggression. And most of them have their aim in the destruction of the enemy (cf. Der Gewerkschafter, Zeitschrift der IG-Metall, April 83).

Pedagogues are not unaware of the problems stated in the above example. In a conference of the 'Gesellschaft für Pädagogik und Information' held at Dortmund this year different positions were

stating (cf. Frankfurter Rundschau, March 31, 83).

a) The participants agreed that the sovereign use of data processing systems will become an indispensable skill within our civilization and for that reason a necessary part of education and professional training.

b) Some claimed that computer-systems offer better and more up-to-date information than any textbook can possibly do.

c) Opposed to that view it was stated that the textbook has many psychological and anthropological advantages over and against computers. It is a medium of a human dimension; it is the most personal means of learning, which allows the human being to follow his intrinsic drive for hunting and collecting and, by that, developing his personality. And the limited information contained in a textbook gives some feeling of safety against the horror vision of being lost in an unending amount of video-text information. And as someone put it, can you imagine reading Shakespeare on video-text?

d) One of the experts favoured a more realistic view. He claimed that German teachers have many reservations about the use of media in general. Up to now 0.8 to 2% of all instructional time is being used for media. The more complicated the use of media the less inclined are German teachers to use them. Perhaps the new media will not have more importance than the micro-computers which thus far comprise about 5% of the student's activities in school.

Can it be expected, it was asked, that the teacher who breaks into sweating when using the video-recorder, sits down comfortably to use a table computer? Are the new media really as new as it is claimed? If, for example, the TV-disc replaces video, can one advise schools to buy these costly systems, when they may soon become older machines which are seldom used? And how is this information system to fit into our understanding of teaching and learning? Will it encourage a strict and narrow learning of facts, that which we are working to eliminate?

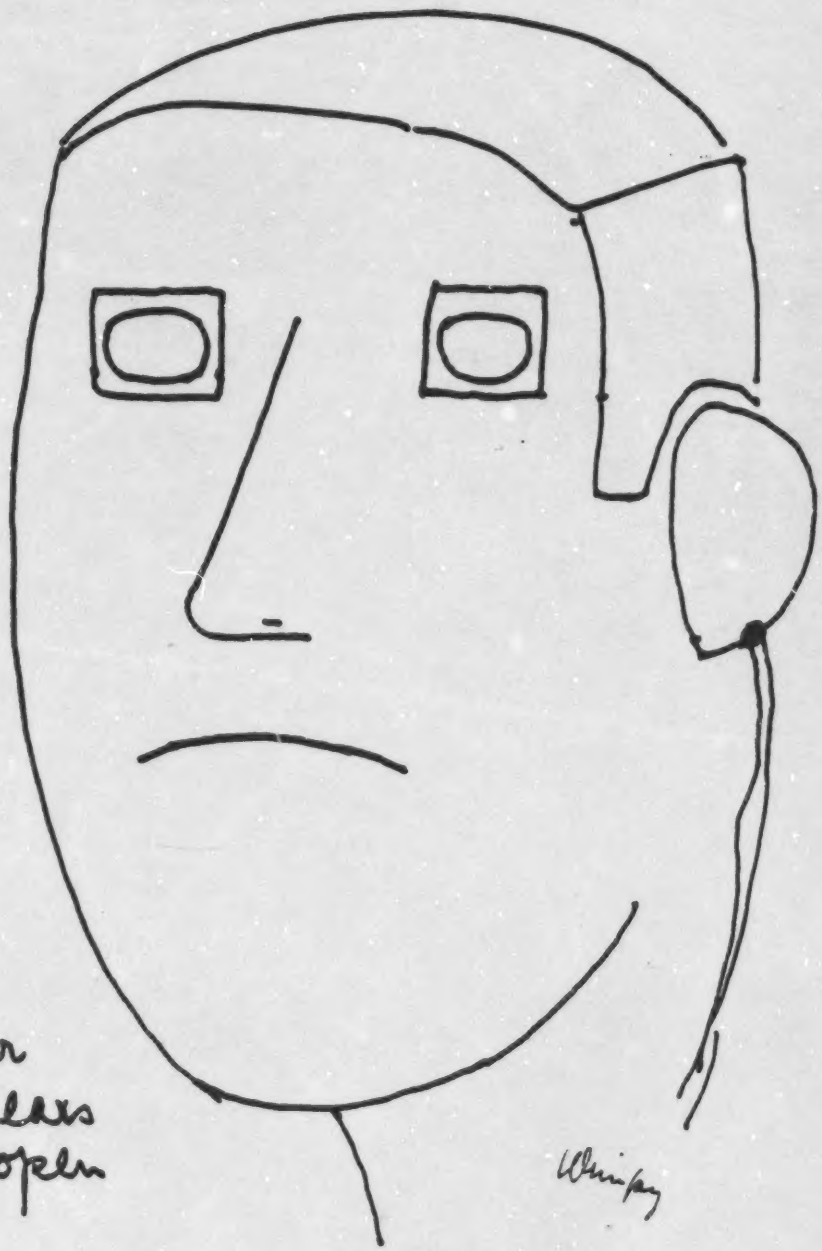
In summary, it seems that German teachers and professors are more reluctant to use the new technology than their students. And, what is even worse: a discussion about computer literacy or informatics in the field of social studies has not actually begun in West-

Germany. There will have to be a re-thinking of our curricula both at the university and in school. If the students are expected to acquire basic and advanced qualifications in computer literacy, professors and teachers will have to do the same.

Presently informatics is provided only in mathematics and the natural sciences. But equipped with this knowledge high-school students soon will be able to make use of electronic media in history, geography and political education. Teachers, however, will find themselves in the position of learning from their students rather than teaching them.

Postscript

Having participated in the June, 1983, Georgia meeting of the Social Science Education Consortium and considered these needs, I have made a proposal to the president of the University of Giessen and the Minister of Education in Hessen for a revision of our instructional programs for teachers. Each student studying to become a teacher should take a basic course and an advanced course in computer literacy. At present, it looks likely that my initiative will be successful.



It's a
wonderful
world:
keep your
eyes and ears
wide open

TECHNOLOGICAL CHANGE AND SOCIAL COMPETENCE

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During the past five years the microelectronic revolution has been brought to the attention of the British public in a spate of television programmes, conferences, and publications. The Government designated 1982 "Information Technology Year," and appointed a minister to promote information technology (I.T.). Central funds were made available for schools to buy microcomputers and related hardware, and a national scheme was set up to train teachers in their use.

New Priorities for Education - The Message to the Schools

Familiarizing teachers and pupils with some electronic devices is, however, only part of the story, though clearly a necessary part. There is a broader message, less specific, more disturbing, more controversial, and infinitely harder to operationalize: that education must help the nation make a successful transition through a stormy period of technological change (see C.E.T. 1978 and Gosling 1979).

I wish to tease out two strands from the tangle of argument, one to do with the economy and the other to do with individuals. Schools are being urged to help produce a workforce with the qualities and skills needed to make the British competitive in a world of high technology; and to help people cope with future shock.

Neither task fits comfortably into the present school system, and both raise fundamental questions about social values and educational aims. Schools have reacted with understandable caution. Before introducing what might be irreversible changes, teachers are anxious to see more clearly what exactly the demands amount to, to sift out the well-based predictions from the futurology, to examine the value implications behind apparently objective economic arguments, and to

decide what types of response might be appropriate, feasible, and acceptable both to themselves and to the communities they serve.

Which Department?

Before pursuing the dialogue further it is important to avoid creating a misleadingly bland picture of Education listening and responding to the voice of the Nation. Nothing in our decentralised system is ever that tidy. There are many voices claiming to speak for the nation, for the economy, for industry. And, at the receiving end of these messages there are problems of responsibility, making "the schools" an elusive target. In whose pigeonhole does the memorandum go? Which departmental head should attend the conference on post-industrial society? As the demand for competence in technological, economic and social matters grows the message is directed at teachers of all subjects, including those responsible for social education. And that which is everyboby's responsibility can become nobody's.

Even to speak of a sub-set of teachers "responsible for social education" suggests a professional coherence that does not exist in Britain. The phrase "social education" means different things in different schools: special programmes for the less academic, some aspects of the pastoral system, work with the local community, industrial liaison, vocational guidance, health education, courses in the social sciences, History, Geography, Home Economics, Commerce. . .

Schools are not in the habit of considering what their students are learning about society, or what social skills and attitudes they are developing across the subjects of the formal curriculum. If we add the social skills and attitudes learned in the informal curriculum--the clubs and other voluntary work to which many schools attach great importance--and the unintended social messages of the hidden curriculum, then the task of overall curriculum review is formidable indeed. Syllabus reform, within existing subject departments, is so much more manageable.

Schools that tried, in response to earlier pressures, to monitor language across the curriculum are all too aware of the difficulties

of shifting the focus of concern from individual subjects to the whole curriculum. Even where a review has been successfully conducted, as at Hele's School, Exeter, there can be severe problems in implementing and sustaining reforms where these run counter to the school climate and where adequate support systems do not exist (Cloke 1980, p 144). But it is precisely this type of comprehensive review that is required of schools as a response to the far-reaching changes that I.T. brings as the Schools Council report "Personal and Social Education in Secondary Schools" points out (David 1982, p 12).

There are some positive signs. A series of publications on curriculum planning from the Schools Council, HM Inspectorate, and the Department of Education and Science has to some extent prepared the ground. Some schools have given senior staff responsibility for overall curriculum development. Some have set up new organisational structures--staff working parties, curriculum planning groups, broad faculties of, for example, humanities or social education--which provide a wider forum for discussion and policy making. Difficulties of communication remain, but schools are more able to receive and consider messages from outside in 1983 than they were ten years ago. I will consider messages about economic survival and individual well-being in more detail.

The Needs of the Economy

Economic survival, it is argued, must come first, because without it individual well-being is in jeopardy. The Chief Education Officer of Sheffield, an area badly hit by the recession in the steel industry, addressed a conference of teachers in these stark terms:

> "When we talk about the risk of not surviving economically we talk about the risks of disaster--political revolution, destruction of our society, collapse of our culture, betrayal of our history...all deeply serious and moral issues. Speaking as an educationist I regard it as vital to get a consciousness of the seriousness of our economic position over to all heads of schools...so that they are in a position to see that the curriculum planning of their whole institution takes account of it" (Harrison 1979).

Following preliminary barrages of this sort have come a number of thrusts in different sectors of the front. Two of these that are particularly relevant to social education are: 1) the broad argument about social attitudes, and 2) a related but more sharply focused proposal for work-related social skills teaching in schools.

Industrial Culture and the Idea of "Capability."

The argument for new attitudes to technology is older than the silicon chip. The Great Debate on industry and education was initiated in the distant days of the last Labour government, by James Callaghan, in his Ruskin College speech of 1976. A collection of essays published in that year under the title "Hidden Factors in Technological Change" (Semper & Coggin 1976) gives a picture of the arguments developed in the early 'seventies, and illustrates efforts in schools to change students' attitudes to technology and industry.

The difference in 1983 is that the factors are no longer hidden, and the impact of technological change is crudely visible on all sides. It is widely argued that recovery depends not on reviving old industries and ways of working but on developing new ones, that it demands a creative effort comparable with that of the first Industrial Revolution, fired by the same conviction and commitment. Recovery is thereby presented as a matter of social attitudes rather than one of government or industrial policy.

This allows blame to be shifted to education, which is held responsible for encouraging social attitudes which deflect the young--in particular, the talented young--away from practical, wealth-producing work. What the young have learned from their experience in school about the relative value and interest of academic and practical activities, of arts and sciences (and within sciences, of pure and applied studies) has contributed to Britain's economic decline.

The case is vigorously made by a pressure group called "Education for Capability," based at the Royal Society of Arts, with wide support in industrial, political and even Royal circles. The group takes full-page advertisements in daily newspapers (The Times and The

Guardian, from February 1980) to publish its manifesto, which argues that "those who study in secondary schools or higher education increasingly specialise; and normally in a way which means that they are taught to practise only the skills of scholarship or science; to understand but not to act..."

The exercise of personal capability, which provides satisfaction as well as contributing to the economy, is not only undervalued: it is actually inhibited by the present system of education, which "...stresses the importance of analysis, criticism and the acquisition of knowledge and generally neglects the formulation and solution of problems, doing, making, and organising...we believe that education should spend more time in teaching people skills and preparing them for life outside the education system; and that the country would benefit significantly in economic terms from this re-balancing towards education for capability."

Prizes and other forms of recognition are offered to schools for new courses and projects that contribute to the overall aim, which is to bring about a significant change in British culture, rapidly enough to save the British economy. Kenneth Adams made this clear to a teachers' conference organised by the Royal Society of Arts:

> "...these excellent developments in education for capability, education in making things and making things work, were thwarted by the powerful and influential educational elite who believed that thinking about ideas was superior to thinking about things..." (R.S.A. 1983).

We may wonder if this interpretation of recent history is the last word on the matter: there may be other causes for Britain's economic decline, other forces at work in our society which influenced both education and industry. We may want to ask questions about the distribution and exercise of power and the relationship of social classes during the century, and base our current policies on an analysis of this kind rather than on one which focuses on education and leaves out politics. We may also entertain a nostalgic regard for "thinking about ideas" and for "beauty and truth," and wish to see these ideals sustained somewhere in the state comprehensive school system. But the diagnosis is clearly persuasive, and the remedy seems

to follow logically: what education has done education must undo. A headmistress at the same conference brought the message home to her colleagues: "In a time of economic recession and increasing international competition it is vital that some of our brightest youngsters should cease to shun a career in industry."

The anti-industrial culture may prove resilient, but the attack is mounted by a formidable coalition. For one of the strengths of the "capability" argument is that it wins friends all the way across the political spectrum. At one end, it attracts those who wish to select and train a technological and entrepreneurial elite, committed to the work ethic, competition, profit and other Victorian values (whose restoration is urged by the Prime Minister). But it also appeals to reformers who have battled for years against the meaninglessness, sterility, and irrelevance of academic courses, and who campaign for a core curriculum that will match the ideals of the comprehensive school, related to the common life.

The schools are being told by Left and Right, by unions and employers, by progressives and reactionaries, by historians and futurologists, that they are in the front line of a cultural battle on which our economic survival depends. It seems to be a temporary detente, based on a common interest in economic survival, between groups of people who have very different visions of the good society. Sooner or later the perennial questions will be asked and the idea of "capability" will be seen as an incomplete answer. For "the culture of doing, making and organising" does not offer us much help in deciding what to do, make or organise, for what purpose, for whose benefit, under whose control. It lacks something essential to the concept of culture: criteria by which to judge ends as well as means.

I shall return to the missing dimension of values later: for the moment, my point is that whatever one's reservations about the message, it is becoming accepted as a truism in educational circles. The "capability" campaign has helped to prepare our minds for the vocationalism which the government is pressing upon British schools.

A Skilled Workforce

Alongside these broad demands for a change in the culture of schools have come more specific proposals for curriculum changes, relating to the needs of a high technology economy for workers with the right sort of skills. While some of these are directed at science, computer studies and commerce departments, others have implications for social education.

New teaching aids. All departments, including social studies and humanities, are urged to use microcomputers as teaching aids: for example, geographers for the analysis of spatial and demographic data, historians for census returns, economists for macro-economic simulations, and teachers of English for creative writing by word processor. The applications are endless, and the justification double-barrelled: not only will students move more quickly and excitingly among the data of the subject, without the tedium of tallying the parish records or calculating the economic effects of a tax increase, but they will also, incidentally, be making themselves familiar with modern information processing devices and methods. This will help to remove inhibitions and blockages, and prepare the way for subsequent training as skilled workers in tomorrow's industries.

There is no serious threat here to the teacher or to traditional academic subject-teaching. Provided the software is cheap enough, of good quality, clearly documented, and relevant to the syllabuses of public examinations, its use can only enhance the subject while simultaneously achieving the new objectives.

New topics. Only slightly more difficult to accommodate within traditional thinking and practice is the demand that the I.T. revolution should be reflected in the selection of subject matter within History, Geography and other social studies courses. The difficulty is that some older topics must be scrapped or greatly reduced, always a fairly painful process, but not one that requires profound change in the teacher or the school.

It has been suggested, for example, that History courses should pay more attention to the role of information in political and social developments, and teach the Industrial Revolution as the beginning of

a continuous and accelerating process, rather than as something which can be neatly contained in a nineteenth century textbook. Geographers may need to revise their teaching on industrial location, and Economists on factors of production and comparative advantage as the knowledge industries expand.

The British Computer Society recommends that humanities and general studies programmes should find a place for topics such as 'Computers and People', 'The Effects of the Cashless Society', 'Artificial Intelligence', 'Computers and the Economy', and 'Computers and Employment.' These are among the 16 topics which the society wants to see in the common core of the secondary school curriculum (BCS 1980). The remaining topics (such as 'The Automatic Control of Processes', and 'Coding Systems') would be injected into science and mathematics courses.

New skills. A third element in the vocational argument concerns the transferable skills that workers need in the information age. There are some surprises here--and some threats to traditional thinking about subjects, methods of learning, and public examinations. The Further Education Curriculum Unit, for example, quotes research evidence from industrial employers, who criticise the products of traditional school courses on the following grounds:

> "What appears to be lacking in many young people is the ability to apply with discernment school-based competencies to day-to-day working problems. This raises the question as to whether at school level the curriculum for most young people is too preoccupied with content related to conventional examination syllabuses, and not enough emphasis or time given to mastery of core skills making transferability to common day to day problems more likely. There is little doubt that with the new information technology the immediate availability of data will require basic competencies in communication..." (F.E.U., 1982).

Eric Bates, Head of the Education Unit in the Department of Industry, questions academic scholarship itself, that holy of holies on which most heads of department in British schools base their professional identity and self-esteem:

> "The pursuit of academic distinction, of 'scholarship'...has been universally accepted as an end in itself. It is only in recent years that some have begun to question whether this emphasis is in the best long-term interests of the country and of pupils...

> Many of the qualities a young person needs are neither taught nor examined. For example, leadership, the ability to work within a team, to communicate verbally, to understand the importance of achieving time deadlines, of cost effectiveness and working under stress...of finding the best possible solution to a problem, often with incomplete or imperfect data..." (R.S.A. 1983).

Curriculum development to foster these skills, and to explore their assessment in the form of profiles rather than subject examinations, is advancing rapidly in Further Education, with substantial help from the Department of Industry. The repercussions are being felt in schools. One effect is to force teachers to think again about their stereotype of vocational education as a crude and de-humanizing process, whereby students are force-fed with specialised knowledge narrowly related to the work they may do on leaving school. For this description may apply to what goes on in many schools, under the guise of scholarship, where students are force-fed with specialised knowledge to achieve the grades that may win them a university place. By contrast, the new vocational education can be presented as humane, student-centered and life-related.

The new vocationalism may contain other, less liberal elements, but it is interesting that reformers of social education in schools should find support from this unexpected direction in their struggle to shift the emphasis from teaching to learning, from facts to skills, from passive note-taking to active study methods, from arcane subject-matter to issues in the students' own world, from the inert to the meaningful. The reformers have never been primarily concerned about creating a skilled workforce: their concern is for the well-being and social competence of individuals. But there is common ground to be explored. The needs of the economy may not be so different from the needs of its individual members.

The Needs of Individuals

Supposing it were possible to develop in school pupils those skills that are being identified as keys to economic survival, and supposing these skills could be made genuinely transferable from one human situation to another--two propositions that need careful

research--would individuals need anything else in their personal survival kit for the information age? The flexible, co-operative, problem-solving workers of tomorrow, with their capacity for holistic thinking, their positive attitude to change, their zest for learning, their initiative, their practical capability, their social and communication skills, are already more than half way to personal and social competence. What else is needed to help them cope with technological change?

Two types of answer emerge from the current debate, the first focusing on democratic participation, the second on private life outside the workplace.

Citizenship and Technocracy

In a Council of Europe paper, Professor Andre Lebeau (1981) makes the connection between technological change and political education. He points to "inadequacies in the education and information of the peoples making up the Western democracies." The complexity of technological issues, and the "intermingling and interactions of systems" have brought about a dangerous situation. "Decisions involving contemporary society have become impenetrable to the average citizen." His optimistic conclusion is that information technology, properly applied, coupled with public education in its use, could make it possible for the individual "to re-establish proper relations with the technology oriented society in which he lives."

As with Alvin Toffler's (1980) vision of political life in an information age, one is forced to ask how such a happy condition would be brought about. It is hard to imagine in Britain today the development of public databases giving citizens access to full and undoctored information about such techno-political matters as the argument over cruise missiles and the nuclear balance, or the destruction of the countryside by farmers subsidized by the Common Agricultural Policy, or the truth about nuclear power.

Whether such a utopian information service is brought into being or not, there is still a need for public education in the use of whatever system does exist. The argument applies as much to

newspapers and television as to electronic databases. There is always a need for independent agencies of education to create a critical clientele, skilled in defeating attempts to pull the wool over its eyes.

As other branches of I.T. offer their own constructions of reality, similar efforts will be required to create sophisticated and wary users of databases, skilled in detecting bias in both the selection of data and in the organisation of retrieval procedures. For anyone who compiles a set of keywords or devises a search tree for a database is shaping the way a future user will think, as surely as a television producer is selecting a view of reality and dumping alternatives on the cutting room floor. In both contexts the result has a bogus objectivity: the "value-free" collection of mere data which only becomes information when it is accessed; the television camera that claims to be a neutral "window on the world." One answer, then, to the question of what else is needed in the survival kit, is this extra dimension of critical awareness. But it is not a quality that generally appeals to employers, even when they are looking for the sort of socially skilled worker that Eric Bates describes. They want problem solvers who will operate within agreed boundaries set by overall company policy. A democracy needs citizens who will question policy assumptions, see through the rhetoric of "national interest," reach out for totally new ways of looking at problems, ask thoroughly awkward questions about aims.

These qualities are especially needed in a society that is undergoing rapid technological change, to counter the technological imperative, to avoid naive faith in 'the technical solution' to every problem, and to make sure that the social cost of technological change is fairly spread in the community. Information technology can be used to support totally different sets of social goals, to manipulate or to liberate, for "the control of disorder" or "the management of diversity"--the distinction made by Mowshowitz (1976) in "The Conquest of Will." He foresaw a time of crucial and irreversible choice for technological societies as information processing became more sophisticated, and warned that the new technology could bring

> "...the abrogation of community responsibility and...the exercise of overwhelming power by legitimately constituted governments. We have already compromised our responsibility for making informed judgements on many matters of local and national policy by deferring to so-called 'experts.' The next step, if taken would constitute a dangerous extension of the Hobbesian social contract."

It is just possible that some spokesmen of government and industry have in mind the probing and radical spirit of critical citizenship when they talk about preparing students for participation in a changing society. But there are signs that something safer and more limited would be preferred in these quarters. Lifeskills tutors have been discouraged by their government funding agency, Manpower Services Commission, from tackling political issues (The Guardian, 29 Nov. and 8 Dec. 1982).

Private Life in Post-industrial Society

The second type of proposal focuses on the everyday lives of individuals rather than on their economic or political roles. The concern is for the survival of self-esteem, a sense of purpose, and satisfying relationships with others. As with the demand for a more practical education, what seems to be happening here is that a familiar and long-standing set of educational aims, associated more with reformers than with mainstream educators, is being moved into the centre of the stage and given a new urgency.

The Schools Council Working Party on Personal and Social Education which I mentioned earlier (David 1982) noted the increased activity of schools in this area of concern. Making little use of the concept of skills, and regarding the behavioural objectives model as tending towards indoctrination, the report emphasizes processes and procedures of personal decision-making, and aims to increase awareness and understanding of self and of other people, self-confidence, and appreciation of responsibilities towards others. It stresses the need to relate the content of courses to the personal experience of students, "Whose feelings and opinions matter."

Very different in style, more specific about student performance, and more committed to the idea of skills training, the manual for

tutors "Lifeskills Teaching" by Hopson and Scally (1981) illustrates a movement developing strongly in further education and beginning to influence schools. They, too, make an explicit connection with technological change, devoting their first chapters to an account of post-industrial society, its dangers and opportunities. They urge schools and colleges to assess their present curricula as a relevant preparation for post-industrial life, and they spell out significant features of this new society which teachers should take into account in replanning curricula:

> "Providing and receiving knowledge and skills is the most rapidly growing area of the economy...
>
> There will be chronic unemployment judged by traditional norms and values.
>
> We will have to move toward a new concept of work...a new concept of career...a changed concept of the welfare state...
>
> There will be an increase in discretionary time for everyone, but more for some than for others...
>
> We are already living in an era of 'overchoice'...
>
> Personal relationships will be more temporary...
>
> There will be a demand for a more adaptable labour force and for people who when unemployed can exercise initiative and generate commitment...
>
> People will need a greater range of personal competencies than ever before." (Hopson and Scally 1981).

Two Sets of Priorities

For some commentators the problem of structural unemployment is of overwhelming priority. Unlike the more speculative features of the new society, it is already here, and having a serious impact on schools, especially in those areas where the majority of leavers go directly on to state welfare rather than to a job. The Council for Educational Technology, in its widely distributed paper on microelectronics, asked bluntly, "What can we do to help people to

fill their leisure hours--whether the result of a reduced working week or the enforced leisure of unemployment?" (C.E.T. 1978).

Schools have always claimed to do more for students than prepare them for getting a job. Marketable qualifications were important, certainly, but what about initiating children into the forms of knowledge, developing their rationality, sensibility and moral awareness, extending their range of interests, broadening their cultural horizons, building a sense of community, refining, civilizing, enriching their lives? Was that no more than educators' sales talk?

When there are no jobs, when the long-deferred gratification does not materialize, or is deferred for yet another year as the student moves from school into a government scheme for unemployed leavers, that claim to provide something more than a passport to a job is put brutally to the test.

Admittedly, the "something more" has often been more evident in Speech Day rhetoric than in daily practice. The challenge from outside has prompted some schools to examine the gap between rhetoric and reality, and to define new priorities for themselves.

Schools are thus in the tricky situation of responding to demands from outside while attempting to re-define and defend some priorities of their own. Their position is weakened by the fact that the unreformed academic curriculum does not convincingly achieve the aims of critical thinking, values education and creativity. They are fighting a battle on two fronts.

School Responses

In illustrating ways in which education is responding to the challenges outlined in the first part of the paper I shall draw mainly on the work of teachers associated with York University, who have been exploring the issues we are addressing today in research studies, curriculum projects, conferences and innovative courses.

A project on Technology and Change based in the Education Department worked with schools in the region, and is now collaborating with the Centre for the Study of Comprehensive Schools, also based at

York, in the compilation of a database of good practice to which schools will contribute and have access. Teachers have also contributed reports of their work at a series of York conferences on technological change, and several have carried out enquiries in the region as part of their work for a higher degree in Education.

Teachers' Views

In a study of Yorkshire schools in 1982 Mitton (1982) explored senior teachers' awareness of, and attitudes to, the emerging post-industrial society and its implications for schools. He found teachers were willing to develop curricula and methods appropriate to a changing society, but felt ill-equipped to evaluate the social and economic forecasts, or to convert the broad demands for educational reform into sustainable changes in their practice. The study showed a marked discrepancy between what teachers felt ought to be done and what was actually happening in their schools. Among the tasks they accepted for schools, but found hard to operationalize, interviewees mentioned the following:

> "To reflect the world as it is outside schools today.
>
> To enable children to adapt to different circumstances and change their lifestyle.
>
> To develop information handling skills including the ability to exploit information technology to find out what they want to know.
>
> Personal and social development.
>
> Emphasis on skills rather than the acquisition of knowledge.
>
> The creative use of leisure.
>
> Making children aware of the benefits and dangers of technology.
>
> Encouraging children to be self-critical, self-motivating and practical."

Teachers saw themselves as directors of the learning process rather than as providers of information; traditional subjects were not necessarily the best way of organising the curriculum, "and might even disappear."

A conference of 150 teachers at York University in 1981 on "Technological Change and the School Curriculum" concluded that:

"Teachers of all subjects should contribute to pupils' awareness of the possible consequences--good and bad--of accelerating social change. They should seek to develop in pupils flexibility and adaptability, the ability to handle uncertainty, and a positive attitude to change. They should use their subjects to develop skill in analysing and solving complex real-life problems...

"Most of the changes that members wanted to see were those improvements in content and method that reformers had been arguing and working for since the 1950s, e.g., more emphasis on concepts and ways of working rather than factual knowledge, more cross discipline study...more active and inventive learning by pupils and less one-way lecturing by teachers, more group work, discussion, simulation, and attention to study skills, more experience out of school and more imaginative use of adults other than teachers. These proposals are familiar enough: what is new is the singer not the song. Teachers are now seeking what formerly was recommended by curriculum projects...

"In common with other workers in the information industries, teachers must be prepared to handle uncertainty in their own work. The curriculum for which they are responsible is developing away from the areas of subject matter within which they are accredited experts. The emphasis must shift from subject-matter knowledge to skill in helping pupils learn." (York, 1981).

Another group at York in the same series of conferences and workshops planned the 1983 conference around the theme of "Social Education in a Technological Age," and identified 8 problems for discussion. Four of these are to do with school policy--defining social education, planning it into the curriculum, managing the hidden curriculum, and involving the local community--and four to do with the classroom--identifying pupil skills, developing appropriate methods, helping teachers who move into unfamiliar territory, and finding ways of assessing pupils and evaluating courses (York 1983).

Industry as Catalyst and Resource

An important influence on social education in the past few years has been the development of collaboration between schools and industry. The aim was initially to promote a better understanding of industry, but the movement is having unexpected repercussions. Most towns could provide illustrations. A York project to promote active learning through links with industry is currently monitoring

experimental work in four schools and one factory. Among the school initiatives are social education courses jointly planned with local firms, simulations and problem-solving exercises based on actual situations in industry, and the setting up of mini-companies in school with advice from local business. The factory experiment involves apprentices and managers in lifeskills courses, which stress the understanding of how small groups work and how to collaborate effectively in solving problems: school teachers are intrigued to find a diesel engine factory training its staff in social dynamics and communication skills, and are anxious to discuss implications for school work.

The national Schools Industry Project reported that its experience of linking adults other than teachers with schools to help pupils understand modern industrial society "raised some fundamental questions for many teachers and industrialists about the nature of schooling." Teachers have welcomed contact with the world outside their insulated classrooms, and the project found little opposition from them to working with non-professionals, who were viewed as a valuable resource for the professional teacher to manage. There was a tendency for industrialists' interests to spread beyond the original boundaries, and schools welcomed rather than trying to contain this influence: for example, a trade unionist, invited to contribute to a module on industrial relations, enquired how the school was handling issues related to information technology, and provided a union perspective on these issues (Jamieson and Lightfoot 1982).

Illustrating the tendency of this sort of work to spread its influence in many directions, Gyte notes two current developments: setting up a co-operative workshop for unemployed school leavers, and "extending the principles and processes of the social education course into other areas of the curriculum."

School-industry liaison can have important implications for authority relations within the school. The national Industry project noted that

> "Treating pupils in a significantly different manner at certain times (for example, fostering co-operativeness rather than individual competitiveness), as a colleague rather than as a child

has implications for their behaviour and treatment at other times in the school." (Jamieson and Lightfoot 1982)

The evidence is as yet fragmentary, but it suggests that the involvement of outsiders can give the new life-related elements in the curriculum authenticity and authority. This is a different sort of authority from that enjoyed by the academic elements which they replace, and on which the teachers' professional identity was founded, but it can have the same function in sustaining teachers' morale. Far from undermining the teachers, the contact with outsiders helps to counter that feeling of inadequacy which a subject-specialist is bound to feel when he moves away from his own discipline into a shadowy and uncertain world of lifeskills.

Other School Initiatives

Not all schools work as closely with local industry, and the following examples show schools innovating alone, or in collaboration with a small number of other local schools. Monkwearmouth School, Sunderland, includes in its social education programme a module on technology with the following aims:

1) "To develop a realization of the impetus and relevance of technological grown in relation to social organisation, relationships, political thinking and the environment.
2) To encourage a questioning attitude towards technological growth, in respect of work, job satisfaction, and control.
3) To develop the capacity for individual or group action in possible areas of conflict.
4) To develop the skills of investigation, comparative analysis and communication.
5) To develop a totally new concept of what is and what is not work, appropriate to the new and developing situation in Western society." (Monkwearmouth 1979).

At experimental course for 12 year olds on "Information" devised by Normal Longworth, with the support of IBM, has been used in a number of schools, including one in York. It focuses on the central role of information in modern society, and introduces students to some key ideas about its collection, analysis, storage, processing and

communication. These ideas are learned through realistic examples--including police work, public utilities, transport, and the school's own information system. The theme brings together material as diverse as road signs, school rules, power station planning and witnesses in the law courts, all contributing to the development of a way of viewing information in social systems (Longworth 1976). A local school using the material reported that the examples dated rapidly, but the central ideas were of value in laying a base for later work on understanding social systems, and for the development of computer skills.

Working with the 16-19 age range, Queen Elizabeth Sixth Form College, Darlington has broken out of the familiar pattern of General Studies--the pattern sustained since 1973 by the publications of the York General Studies Project--in which classes discuss current controversial issues on the basis of small collections of source material which put contrasted viewpoints. The most recent of these collections was on Information Technology (Smith & Campbell 1981). Charles Walker worked with a team of fellow teachers to transform "what was a stagnant General Studies course based on an options roundabout to one which attempts to put into practice the proposals on lifeskills" (Walker 1980). Three compulsory courses are taken. In one, students "explore the different ways decisions are made... to analyse the effectiveness of individuals and groups in problem-solving and decision-making, and to introduce some...simple organisational and analytical skills." The other two courses provide opportunities to apply these skills and develop them in realistic contexts, one at the level of personal decisions (e.g., money management, self-presentation, rights) the other in matters of public policy (currently a study and simulation exercise on a proposal for a nuclear power station, and involving pressure groups, the media, scientific advisers and government). Walker reports that the new course is seen as useful, relevant and authentic: "General Studies is now talked about, not in a derisive way, or an apologetic way, but enthusiastically and constructively by staff, students and parents." The effect on staff--all experienced and well qualified subject

specialists--has been striking: "Teachers talk to each other about their methods and aims continuously, for we are all in a new situation in which the traditional role of the Advanced Level teacher is completely set aside."

Combining Understanding and Skill

These examples illustrate what could become an important development in social education, humanities and general studies, formed by the convergence of two traditions. On the one hand there is the tradition that seeks understanding of major social issues by means of disciplined study. This may involve evidence-based open discussion on the lines of the Humanities and General Studies Projects, or it may be more explicitly based on the social science disciplines, taught separately or in an inter-disciplinary form by a team representing several departments.

The other tradition emphasizes transferable skills that will be useful in everyday life. It is well established in further education colleges, in remedial education, and in special units for disaffected pupils. It also appears in courses on thinking (where the work of Edward de Bono has been influential), on study skills and the use of libraries and other information sources, and in the work of vocational guidance and counselling staff on presentation of self, interpersonal relations, transactional analysis, assertiveness training, personal decision making, and ways of handling stress.

These two ways of interpreting the phrase "social education" appear to be converging. Work experience placements, community service schemes, and some social studies courses (such as those derived from the Nottingham Social Education Project--see Rennie 1974) emphasise the development of skills of human relationships, communication and practical action, as well as the understanding of issues. Initiatives in peace education stress experiential methods and inter-personal skills--education for peace rather than merely about peace. Keith Webb's MA research (1980) showed the possibilities of combining political skill development with the more familiar aims of political knowledge and attitudes. Understanding social problems

without the practical skill to do something about them (what Webb called "informed and enlightened impotence") is increasingly seen as inadequate preparation for life in a changing society. Conversely, the development of skills out of context, divorced from an understanding of the actual social and moral problem-areas in which they might be deployed (Webb's "ignorant but effective unscrupulousness") is equally inadequate. Better to practise and sharpen skills of political and social action in naturalistic settings, dealing with real issues like nuclear policy or unemployment, than to learn skills or study issues separately.

The Problem of Authenticity

Courses that try to develop understanding and skill relating to everyday life are not always received the way teachers intend, and there may be an uncomfortable gap between the rhetoric of the curriculum planner and the reality of the classroom. An MA study by a Yorkshire teacher, Fred Middleton, examined a course designed to increase students' social competence (Middleton 1979). The course, given the forbidding title "Social and Moral Education," was constructed by a team of teachers around the "needs" of students and aimed to prepare them for adult life. But only on rare occasions did pupils' conceptions of their needs match those assumed by their teachers. Misunderstanding was mutual, for the pupils did not appear to appreciate the distinctive aims of the course that should have set it apart from conventional subject courses.

Lifeskills under whatever name is clearly a high risk area of teaching. One of the many risks it runs is that of being misunderstood by the students. This may sometimes be because the students--their needs, their lives, their problems, and the skills required to solve them--are misunderstood by the staff. Clearly, any course that aims to develop students' social competence in handling real-world problems needs continuous, sensitive monitoring of the students' perspective. It is not unreasonable to expect teachers to deploy in their own work the social skills they aim to teach: in this case, the ability to stand in someone else's shoes.

Implications for Teacher Education

An example of failure was necessary to balance what may well be an over-optimistic interpretation of current trends. It would be easy to illustrate the difficulties faced by teachers, and the perilous state of their morale, as a consequence of severe cuts in funds, falling rolls, school re-organisation, and the strain between traditionally autonomous schools and an increasingly interventionist stance on the part of central and local government. But I share the guarded optimism of the Schools Council Working Party on Social and Personal Education, which came to the conclusion that "The difficulties are manageable."

The Working Party called for more school-based in-service education, and for courses which whole staffs take together, to prepare them for a review of the whole curriculum. This seems a more appropriate strategy than sending individuals on courses and hoping that they will influence colleagues on their return.

There may also be a need for some special training for individuals, once the school's needs are identified, to provide expert consultancy within the team on matters that are likely to arise as the new curriculum develops. The team needs to decide on a division of labour. For example, it is probably unnecessary for all the teachers to learn to programme the microcomputer, especially if the opportunity cost is that nobody has time to develop contacts with local firms using information technology, or to become the school expert on the broader economic effects of I.T.

Apart from developing a particular area of knowledge to contribute to the team, what do all teachers need in the information age as a part of their continuing self-education? In one word, communication. They need channels for purposeful discussion other than those of the traditional subject sub-cultures; opportunities to work with teachers of all subjects and with adults other than teachers; and encouragement to listen more closely to their pupils. There are many ways in which to achieve this aim. From working with schools and teachers over the past five years on the implications of the new technologies, I would identify five particularly valuable

types of experience, the opportunity for which can be created in, around and between schools:

1. Learning about the changes taking place in industry, the economy and society, by out-of-school experience in workplaces, by easy access to up-to-date sources of information, possibly by means of an electronic database, and by discussion with other teachers and with people in local industry and commerce;

2. Obtaining information about relevant work in other schools, again possibly by means of a database, linked with a system of release for visits and discussions;

3. Developing new teaching skills, particularly those related to guidance and social skill training rather than to the teaching of their main subject, by means of observation, practice, feedback and discussion with a friendly critic;

4. Playing an active part in continuous research on the work of their own school, to provide information--especially from the students' perspective--to guide their own reflection and the school's self-evaluation;

5. Participating fully in collaborative curriculum planning, involving staff from all departments, students, and adults other than teachers, with provision for critical reflection on this whole process.

Conclusion

I suggested in the first part of the paper that schools should both respond to the demands of industry and government and at the same time maintain their own priorities--critical thinking, a concern for values, and access to non-commercial forms of cultural expression. The examples I have quoted show that at least some schools are attempting to keep both sets of priorities alive.

Others may go overboard for vocational preparation and narrowly defined lifeskills. Some will resist attempts to invade their academic citadel, and go on providing the traditional subject-courses for as long as there is a clientele. Some teachers I have talked to see their critics as materialistic philistines, or detect a national right-wing conspiracy to impose education for conformity. There is false polarisation and caricature on both sides, to offset the evidence of convergence and reconciliation.

The pessimistic view is that a combination of technological change, economic recession and right wing government will push us

towards a new version of Huxley's Brave New World, with academic education for the Alphas, technical training for the Betas, and leisure education for the rest. I incline--guardedly--towards the optimistic view. Given adequate communication and regrouping of forces within education, the two sets of aims are compatible as guidelines for the core curriculum offered to all pupils in our comprehensive schools: economic survival and individual well-being; capability and a critical spirit; skill and understanding; social competence and moral autonomy. The micro-chip has triggered revolutions in all sorts of unlikely places, perhaps it will also work its magic in the social area of the curriculum.

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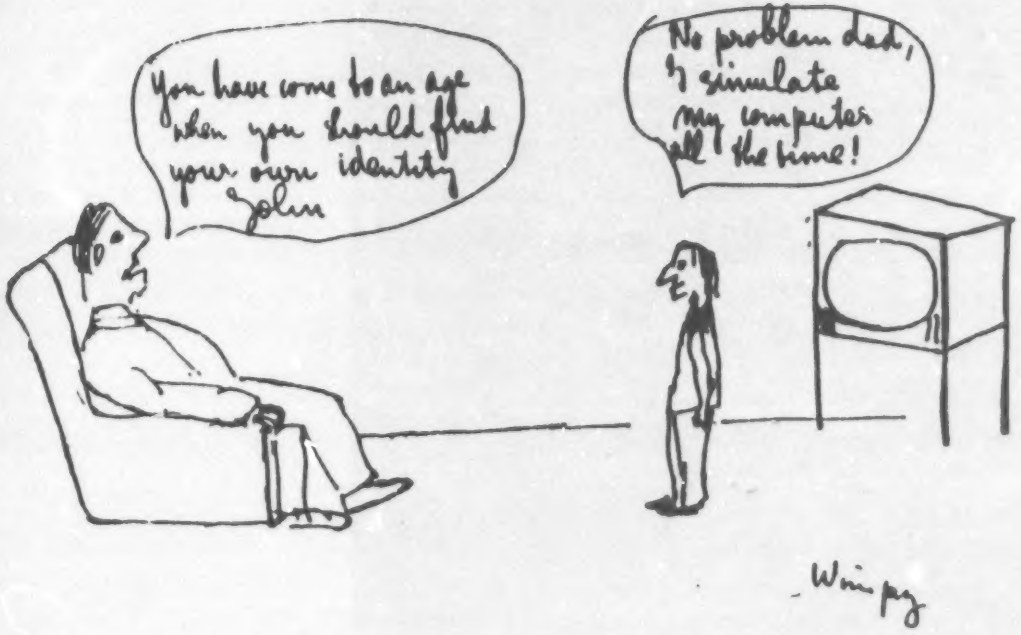
You have come to an age when you should find your own identity
-John
No problem dad, I simulate my computer all the time!
Wimpy

EFFECTS OF ELECTRONIC TECHNOLOGIES ON OPINION FORMATION AND ATTITUDES OF YOUNG PEOPLE

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The Present Societal Context

The attitudes of young people are of continuing and even growing concern to researchers, the mass media, and the adults in their after-dinner conversations. In the fifties and sixties sociologists who studied youth ventured to give their empirical data concrete verbal form and thus coined images of a single young generation, such as the "sceptical generation" or "youth viewed as a factor of social change." In the 1980s a dominant or unique paradigm is not visible, and it seems that researchers no longer attempt to create one. Instead, the picture of the present generation is diffuse; a plurality of approaches is necessary to cope with the contradictory data and images regarding youth. In addition, and this is my own position, there is a comprehensive perspective which promises to give more accurate and useful results. Instead of isolating youth, it considers youth as an integral part of the society.[1] This approach presents two key concepts which form the basis for the following analysis of the effects of electronic technologies:

1. *The conflict of generations today* - which has specific, observable and unique to our time phenomena of conflict, misunderstanding, and alienation between youth and adults.
2. *The change of value patterns* - which affect the behavior and value orientation of young people and lead to conflicts, deviant behaviour, and a separate identity of the young.

Following this approach and using these two key concepts, the decisive questions are not what are the characteristics and problems of our young people, and why do they behave this or that way? Rather,

the questions are: 1) What is the nature of the situation created for young people by our present society? (Including in the analysis adults and youngsters, public and private educational and other institutions, and the changed societal structures with regard to their political, ideological, economic, etc., aspects.) And, 2) What is the relationship between the phenomena of youth culture today and the various factors mentioned in the first question?

Within the process of societal change, one element is especially influential on the value orientation of young people at the present time, and that is the *increase of public socialization*, which is at the expense of private individual socialization. Children and youngsters are from kindergarten onwards under the influence of publicly organized, socialized, planned, and institutionalized education for a much longer period of time. These socialization processes are accompanied, reinforced, or weakened by mass media influences. This, again, is a kind of public, institutionalized socialization at the expense of private development, educational aims and content. Individually formed and freely chosen communication and social life have to give way to publicly organized, often contradictory forms. These tendencies and trends make it increasingly difficult for youngsters to find their own identity and their own value orientation. Very often it leads to feelings of alienation and anxiety produced by exaggerated expectations of achievement and by isolation.

A majority of youngsters find less satisfaction in work - more of them want to enjoy their lives first and foremost, and few consider life to be a "challenge." For a majority of them the future has a rather dull, almost hopeless perspective. With regard to central political attitudes the gap between the generations is getting wider, the minimum social consensus seems to be vanishing. There is a certain indication that material aims are, to a certain extent, giving way to post-material aims.[2]

The Importance of Mass Communication for Modern Societies in Terms of Media Usage and Media Assessment

The influence of modern communication technologies on the formation of political opinions and attitudes of the young has been

examined in many studies since television, radio, and newspapers play an important role in modern societies. For example, the main results of an empirical survey conducted during the election campaign in Jerusalem, Israel, in May 1977 with a sample of 372 high school students[3] indicates the following:

1. The amount of information coming from the mass media is significantly larger than from personal resources. Parents are an exception. They are still more important as sources of political information than the other primary groups and are as important as radio. Television and newspapers, however, are more highly esteemed as rich sources of information than parents.
2. Those who use one mass medium tend to use the other media too. With regard to personal information sources the survey shows a kind of splitting. Either sources are used within the family (parents, siblings) or outside it (friends, teachers, youth movement leaders).
3. Mass media are important factors in the development of political involvement and in opinion formation. In this respect they surpass the effects of personal information sources. The highest correlation was found between appreciation of the newspaper as an important information source and intensity of political involvement. The latter correlates to a higher degree with the use of all three mass media than with dependence on personal socialization agents. A similar trend can be observed regarding ability to form one's own political opinion.
4. Intensity of political involvement and formation of political opinion correlate highly with the frequency of exposure to TV news and discussion programmes and the measure of interest in such programmes.
5. Age correlates highly with intensity of political involvement, but not with ability to form one's political opinion. Younger children get their political information from their parents and friends, whereas older children tend to get theirs from newspapers and radio programmes. The tendency to get a good deal of political news from the parents correlates positively with the educational style of the father or mother.

Generally speaking, modern communication media seem to fulfill the cognitive needs of youngsters to get well-balanced information. This also includes the presentation of different views on controversial issues as well as the need for independence from personally filtered information. These needs are satisfied by using more than one medium. TV is especially important for the younger age groups and for children from a lower socio-economic background.

In the Israeli survey of 1977, conducted in the hot-house atmosphere of an election campaign, mass media were found to take priority over primary groups as information sources and served as important factors in the development of political involvement and in opinion formation. But is it legitimate to generalize these results and apply them to more normal situations which are without the incentive of an election campaign? In many other research projects the role of media, especially TV, in building up political knowledge is viewed differently. As stated above with reference to youth problems, the effects of mass media cannot be adequately assessed without including the *entire societal context*, within which the various dimensions of political socialization processes, including those effected by mass media, must be studied.

Results of the Israel survey suggest that TV and the other mass media would, given a denser programme structure and better provision with TV sets, video systems etc., become more and more powerful socialization agents, especially for young people, displacing all other factors and agents of these processes. Is this notion backed by facts?

In the Federal Republic of Germany we fortunately have a long-term study covering the years 1964, 1970, 1974, and 1980, evaluating the use and assessment of mass media by German youngsters and adults.[4] In 1964 55% of West Germans lived in households with at least one TV-set; in 1980 the figure was 97%. In other words, in terms of technical equipment nearly every home in West Germany has a TV set.

But this figure is not identical with the actual usage of the equipment. On the contrary, notable changes in usage were found: Young people who are politically interested, but have a rather modest school education watched TV in 1980 much less than in 1974.

Youngsters with a more ambitious school education are reached slightly better by TV programmes in 1980 than in 1974. Young adults (age-group 20-29), as far as they are politically minded and with a good school education, use TV significantly less than in 1974. For the age groups 30 to 39 and 40 to 60 the results are similar. Only the age group of 60 and older, as far as they are politically uninterested and only have a modest school education, rely significantly more on TV than in 1974.

With respect to *radio programmes*, politically interested youngsters with more than elementary and lower secondary schooling (Hauptschule) are reached significantly more as daily listeners in 1980 than in former years. Politically less interested youngsters, independent of their school career, are reached less. For the other age groups the correlation between political interest and use of radio programmes varies and a general trend cannot be stated.

The use of newspapers is, as a whole, astonishingly stable. An exception is that the formally well educated and politically strongly interested youngsters use them less.

The time allotted for the use of these three forms of mass media increased considerably (now 1.5 hours a day). The expansion of leisure time was at the expense of sleeping and eating times. Radio programmes are listened to predominantly outside leisure time. Leisure time, which was previously spent mostly at home was spent to a much greater extent outside the home in 1980. In this context we can speak of a real shift in behavioural trends.

Very important is the result that political interest and a better formal education have, as a whole, a kind of reinforcement function for the use of mass media. TV does not participate in the increase of leisure time and is used significantly less as a leisure time medium.

Regarding competition between the mass media, the three mass media reached almost equal portions of the West German population in 1980 (TV 77%, radio 76%, newspaper 69%). Compared with 1974, TV had improved its range in 1980 by 30%, newspapers by 7%, and radio had remained unchanged.

TV did not take away market shares from the other media, but it

is used parallel to the others. In 1980, 97% of the people were reached by at least one of the three media (in 1974 93%); 42% (compared to 1974) used all three media daily.

The numbers of recipients of political programmes have increased, more distinctly with radio and newspaper than with TV. The substitution thesis for TV is refuted. The people in West Germany who use the mass media tend to use them complementarily or at least additively. There has been a significant increase of political interest in actual political issues; in 1980 44% said they were highly interested in political issues compared to 20% in 1964. But political interest has almost no influence on the use of political programmes, especially in TV, which is as a whole lower (e.g., in 1980 69% for the politically strongly interested, 66% for the scarcely interested people). Radio and newspapers better reached the slightly politically interested people in 1980 than in 1974. The correlation between political interest and use of TV or radio is similar; it is much higher with the newspaper. As a whole, TV programmes potentially could defeat political non-interest as they are especially used by people who do not have alternative sources. However, the central question of the role of TV in the political socialization of wide sections of the German population, especially youth cannot be completely answered by these data.

Answers to the question, "How urgently do you personally need TV?" show that TV has lost ground in the subjective assessment of this medium (burn-out effect). In 1980 52% of the population stated that they would not miss radio, 60% would not miss the newspaper, and only 47% would not miss TV. These results are similar to results in the U.S.A., where the opinion of people about TV is much more critical.

The functions of the mass media are seen to be slightly different in 1980 compared to 1974. TV is still considered to be an important source of information, whereas its other functions are critized much more. Radio is considered to be more up-to-the-minute and better suited for recovering from daily stress. The main function of newspapers is seen in their local information. These opinions do not necessarily correlate with the actual use of

these media.

For TV programmes, the range and amount of viewing time are stagnating. Radio programmes were able to gain parts of the market outside leisure time. In spite of the extension of TV programmes, there is no increase in TV-consumption to be observed. The use of TV is strongly dependent on age and educational status. Younger people (below the age of 30) were reached less by the three mass media in 1980 as compared to 1974. (An exception is radio listening by politically highly interested people.) In 1974, TV and newspapers were reaching young people at below average levels; in 1980 this trend was intensified.

Other leisure time activities in 1980 were higher or at least equal to the time given to the three mass media. There seems to be an ongoing process of differentation and specialization among different communication groups. So records, books, and periodicals have become more important for youngsters than newspapers.

If we use for our interpretation Maisel's theoretical three phase-frame[5] (i.e., 1) media for the elite, 2) popular mass media and 3) specialized media for differentiated communication groups), then we could argue that West German society is at the moment in a state of transition from the industrial to the post-industrial phase, based on a high educational standard, relatively high social security and welfare for almost all, freely available time, and sufficient population size. As a consequence the use of the media follows (according to the "Uses and Gratification Approach") a highly differentiated, need-oriented behaviour pattern of the population. The mass media - as a consequence - lose as a whole because of their high generality and unspecific character. Especially young people with a relatively high educational standard prefer special media for groups with homogenous information needs.

Irrespective of this general trend we have to differentiate not only between actual use and opinions about mass media but also what people really learn in terms of knowledge acquisition. There is some proof that for many people, especially youngsters, only fragments of news events, isolated from their contexts, are communicated.[6] In other surveys it was found that about two thirds of the news did not reach the viewers' understanding.[7]

From a survey with 703 kindergarten and primary school children (age group 5 - 11) in the U.S.A. in 1973 it was learned that almost 50% of the children viewed special children's television news programmes. Sex, age, and family structure are important variables (e.g., boys use these programmes much more than girls). Race and socio-economic status have no influence on TV-viewing. As a whole, viewing TV news leads to a slightly better knowledge about political and public events and persons, to a greater readiness to talk about the news with parents and friends, and, for about 50% of the TV-viewers, to a recognized need to get more information.[8] This survey, as well as many others, refutes the old thesis that children do not use TV news.

However, it is also clear from research that TV news is often not consciously sought by children but is somehow accepted if placed in the programme between two entertaining productions. There was no positive correlation to be found between using TV news and educational TV and no positive effects on school performance. If parents discuss present political issues there is also an intensified use of TV news by the children. Older children profit in terms of more knowledge, younger children are influenced affectively. But it is doubtful whether the mass media have become "the new parent."[9]

Emotional effects are probably the most important factors in the socialization process: Knowledge conveyed by radio and television is forgotten in the usual way - at first faster, then more slowly. Emotional first impressions generated by these media, however, remain virtually unchanged. There is no forgetting, no alteration to be observed.[10]

American researchers have examined the effects of programmes for the following mostly affective fields: violence, the roles of the sexes, questions pertaining to racial problems and minorities, as well as advertising. It has been found that although television may influence children, there is nothing to indicate that there has to be such an influence. The one area where it does appear very likely that TV influences a child, is that of aggressive behaviour induced by watching violence on TV.[11]

The Heavy Viewer in the Socialization Process

Among children and youngsters there are those who have a tendency to develop a heavy viewer disposition which increases the more TV programmes are offered. In certain social groups one of the effects of TV viewing is the development of a so-called "mainstream effect," i.e., TV seems to support relatively common viewpoints of persons in similar age groups and/or social strata. On the other hand non-heavy viewers, especially among children and youngsters, tend to show widely differing viewpoints. There is also a distinct correlation between heavy viewers and less education.

A second construct in this *cultivation theory* is the so-called "resonance effect." If what one sees on the TV screen corresponds to what one considers to be social reality, then there may be a sort of cumulative effect.[12] Thus the cultivating effect of TV is doubled. As a consequence, heavy viewers in particular may become victims of fear of oppression, alienation, and of the approval of violence.

The *cultivation theory* has more unsolved than solved methodological problems and sharp controversies. It is not the purpose of this paper to go into the details of this academic battle. But the theory seems to offer an explanatory capacity which can be used in combination with the research findings reported in other sections of this paper.

A German reanalysis of G. Gerbner's cultivation-theory approach showed indeed some methodological deficits. But the theory as such is not refuted.[13] Gerbner's research seems to be a step in the right direction. And there are additional findings from a German research project on television (age group 11 - 15) using a different methodological and theoretical framework which to a certain extent support some of Gerbner's main theses:[14]

- Girls show a higher rate of physical and social anxiety than boys.
- The physical anxiety diminished after some time, the social anxiety remains stable.
- Heavy viewing is a relatively stable trait.
- Heavy viewers have a higher rate of anxiety than light viewers.
- Higher anxiety leads to heavy viewing, and this again reinforces anxiety.

- Personal faculties and situational factors influence the development of anxiety more than TV. But for the assimilation and reinforcement of anxiety the quantity of TV-viewing plays the central role.

New Electronic Technologies and Their Possible Effects on the Political Attitudes of Students

The number of communication technologies available to all is steadily increasing, and the boundaries between them are breaking down. Instead of isolated pieces of hardware systems these new systems (e.g., video systems), allow multifunctional configurations. They not only connect technological elements within a household, but also widen the potential beyond its boundaries and make, for instance, large central computers accessible to the individual.

In addition to the old and popular hardware like radio, TV, audio-cassette and video-tape recorders, and telephone, new electronic developments are conquering the markets. Among these are home computers, video discs, access to data banks through data networks, interactive videotex and satellite and multi-channel cable TV. The communication/information revolution is upon us, and the question is not whether it will have effects on all of us, especially on young people, it quite certainly will, but whether we make it a useful instrument and integrate it in planning the future. Will we lag behind again and lose the chance of influencing the technological revolution for socially and individually acceptable aims?

At the moment the situation does not look promising. It is predicted that within the next 10 - 20 years every child and student may have his own computer. However, today most of the adults and especially the teachers remain computer illiterates, missing chances to use the inter-active capacities, and missing out on the potential for individualized learning; applications to complex everyday problems, and integration of living, learning and occupational environments. The institutionalized educational systems may lose even more ground than is at present the case and become marginal compared to the individualized home education systems which will undoubtedly develop.

But who will be responsible for the aims, the content, the hidden curriculum behind these systems? Who will make the immense quantity of software needed, and following which principles? "The

modern electronic tools have a way of developing a dynamic power of their own which will affect our thinking on concepts, aims, and methods of education... ." They bring with them "also a revolution of ideas. These new technologies will give us new understandings of specific subject matter and new understandings of the process of learning itself. Indeed, learning to use computers may change the way they learn everything else."[15]

These new highly-developed and sophisticated communication technologies have no equally developed counterpart in terms of educational concepts, especially regarding insights into their effects on youngsters.

Certain political effects are already foreseeable: The less educated and the more dependent youngsters are, the more likely they are to become manipulated victims of anonymous social and political opinion agents. The irrational elements in our societies may gain power among the uneducated mass of the people. Fear, violence, and aggression may increase. The gap between the educationally privileged, mostly independent learners and the underprivileged may become insuperable, with major political consequences for our societies. The findings reported earlier in this paper will become maximized if these developments continue in an uncontrolled way.

What can be done? My personal answer is to encourage all forms of non-traditional independent learning - as found all over the world - thus forcing the traditional educational systems, if they wish to survive, to accept independent non-traditional forms by using modern communication technologies. The time has passed when it was possible to adapt educational technology to the classical teacher-classroom-learner model. Today, schools have to adapt to new learning needs of the masses of people. Teachers have to change their roles and become facilitators of learning for living, working, and learning environments.

Communication technologies can make these aims realizable towards some useful humanistic end. But if we do no attend to them, they will tend to become an end in themselves. This would mean the end of human culture. Democracy would have lost the decisive war.

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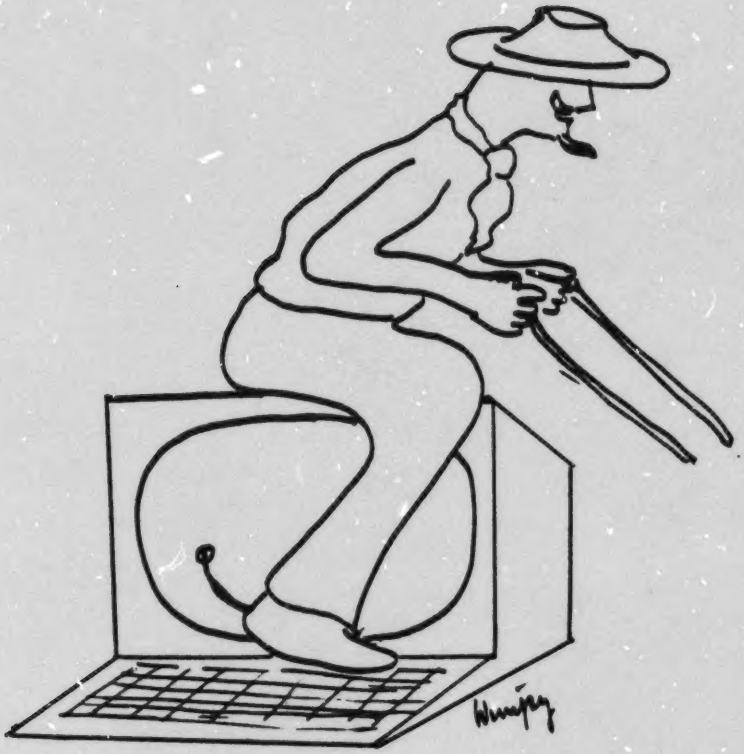

Lonely cowboy riding high
on "New Tech"

THE NEW TECHNOLOGIES AND EDUCATION IN EUROPE: THE FRASCATI CONFERENCE

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The new information technologies, in particular computers, are playing a more and more important role in the member states of the Council of Europe's Council for Cultural Co-operation (CCC).[1] Society and the labour market are clearly influenced by computers.

So far, general education in most countries has tended to neglect problems of technology, leaving them to vocational education. Co-operation between general schools and the world of work has not been well developed. In view of the rapidly increasing computerization of life on the one hand and growing youth unemployment on the other, politicians, industry and trade unions urged schools to improve the preparation of young people for life (see the CCC's Project "Preparation for Life") and to make them familiar with new technologies.

Council of Europe Action

Ministries of Education, concerned about information technology, took the problem up at the European level and had it included in the CCC's programme for 1982. At the invitation of the Italian Ministry of Education, an Educational Research Workshop was held at Frascati (near Rome) in November 1982. Its aims were:

- To evaluate research in the field of computer-related instruction at secondary school level.
- To draw attention to the consequences of research findings for educational policy.
- To identify areas of future research.
- To encourage European co-operation in this type of research.

Commissioned papers and national reports, both describing the present situation as well as research and experience, were discussed

in plenary and group sessions. The conclusions were summed up by the Rapporteur General, William R. Broderick, UK. All of the Frascati papers have been published by Swets Publishing Company in 1983.

A similar Workshop is to be held in Scotland in 1984 which will discuss science and technology (including computer studies) at primary education level.

The general picture emerging from the Frascati workshop indicates the following about the present situation in CCC countries:

1. There is growing concern among education authorities about introducing some form of computer studies at school.
2. Apart from training programmes for future computer specialists offered in all countries, vocational education programmes for non-specialists at upper secondary level have been developed in numerous countries. The aim is to prepare young people for contact with the world of computers within their chosen occupational fields.
3. In *general secondary education*, some countries have made serious attempts to introduce computer studies, computer science and computer-based learning and to provide all schools with computers. The most advanced countries in this respect are perhaps France, the Federal Republic of Germany, Sweden and the United Kingdom. In France, Bavaria (Federal Republic of Germany), England and Scotland, nationwide programmes have commenced (e.g. micro-electronics programme in England and Scotland). Where there are no such broad national programmes, all the many initiatives and pilot experiments are often not well co-ordinated within the framework of an interaction network.
4. Certain countries (e.g. Austria and Switzerland) are somewhat reserved as regards the nationwide introduction of computer-related instruction in general education and prefer to concentrate their efforts on vocational education. Some people argue as follows: People cope with motorised society without studying automobile science at school, why should this be different in the case of computers! Others, however, point

out that computerization has resulted in greater intellectual mobility, and this, contrary to physical mobility, requires preparation at (general) school.

5. Opinions are divided as to whether computer education should be commenced at *pre-school* and *primary school* levels. Some people argue that children should at least learn how to use a computer as a tool (not at this stage for problem-solving but for simple things such as counting, adding and subtraction). The UK offers a good example of this approach.

Main conclusion from the Frascati Workshop

A summary of the conclusions of the CCC experts attending the Conference follows:

1. Schools not yet engaged in computer-related instruction should be encouraged to take a big step forward.
2. It is vital to offer some computer studies for all children in secondary education (either in the form of a separate subject or through the various other disciplines) to achieve "computer literacy" (but one should not offer too much). Programmes in Austria, France, the Federal Republic of Germany and the UK might serve as an example.
3. Computers are becoming cheaper and cheaper so that nearly all schools can afford one, but it is not enough just to count the number of schools so equipped. Quality matters more than quantity. Many of the computers used in schools are technically out of date and far too difficult to handle.
4. Computer science should be offered to pupils interested in learning more about computers (in general as well as in vocational education), because in 15 years 50% of all jobs will be affected by computers. Too much specialization should, however, be avoided, otherwise graduates will not be employable. Research confirms that the French, German and British approaches to computer science as an option has been quite successful.
5. Experience shows that computers can be a very useful learning tool in all disciplines. There is no need to fear that computers will ever replace the teacher.

6. The range of suitable software offered at school is still far too small. What has been developed elsewhere might be taken over and adapted to local conditions.
7. All teachers should learn something about computers in their initial education. In-service education and training is even more vital because there are 10 pre-teaching students for every 90 in-service teachers. All teachers should learn how to use computers as a tool in the classroom.
8. One should, however, not be too optimistic about computer-related instruction in secondary education. The bad experience with programmed learning in the 1970s, as well as earlier illusions about the rapid spread of audiovisual aids in the classroom, would seem to justify a word of caution. Even if microcomputers have become cheap, computer-related instruction will require considerable investment (e.g. software packages) and teacher training efforts.
9. Future research should examine the optimal degree of specialization to be offered in computer studies.
10. Future action should concentrate on making good examples (case studies, software packages for various subjects, etc.) more widely known.

Computer-related Instruction in European Secondary Education

Some introduction to computers is essential for all students, both in general and vocational education. Many would even speak of *computer literacy* but not all countries accept this notion. Experience shows, however, that school should offer *enough but not too much*. Conclusions of the Frascati Workshop drawn from group reports and the Rapporteur's summary on secondary education are as follows:

1. Contents of Computer Studies for All
   - Pupils should know of the implications and limitations of computers, which will figure more and more prominently in life.
   - They should learn how to store information, how to retrieve it and how to structure it in order to deal with problem-solving.
   - They should know how to explore a number of applications of micro-electronics in business and industry.

- As a consequence pupils should have some idea of the impact of computers on society and career prospects and be able to cope with social problems that may arise.
- Programming should occasionally be taught but is not really necessary for all pupils (maybe for just 20%). What matters is that all learn to understand the basic elements of a computer programme. A particular computer language learnt in school may be useless in later life.
- Postive experience has been gained with ready-made packages to illustrate computer use.
- Teaching the technology of particular machines is useless.

A. Strategies for the Introduction of Computer Studies

- Computer studies often fail to be successful because teachers have not been involved in the preparation and development of the teaching programmes.
- The imposition of computer studies may also lead to failure.
- Schools should not duplicate their efforts but look to models elsewhere and adapt these to their own needs.
- Practice should be related to the needs and abilities of pupils.
- Two approaches have, so far, supplemented each other: (1) schools offering proper computer courses (e.g., the 24 hour minimum programme used in Switzerland) and (2) schools promoting the didactical application of the computer in various subjects (see item 3 below).
- Computer studies as a compulsory subject (with a fixed number of hours per week over a period of several years) at primary or lower secondary level cannot be enforced under present circumstances.
- In the short term it may take too much time to introduce computer-related instruction in all disciplines or for all teachers to become familiar with computers. At present it is not even possible to introduce a year-long computer course with fixed hours per week. The easiest solution is to offer a compulsory course of a few hours per week for part of a year.

B. Limited Optimism

- One has to be realistic in the face of all these suggestions. Ministries of Education and the general public sometimes overestimate the value of computer studies. In most countries conditions are such that spectacular results cannot be achieved overnight. A ministerial decree ordering computer studies for all as from, for example, next Monday, would not be acceptable in most countries.
- Ministries will have to examine how they can best influence classroom practice to ensure that appropriate action is taken.

2. Computer Science for Some Pupils

A. Need for More In-depth Studies

- In about fifteen years 50% of all jobs in Europe will be influenced by computerization. It is obvious that many people will need to have a little more knowledge about computers than is suggested in 1.
- Computer-based education should not be left to industry to train on the job as this would probably be too specialised and neglect to impart an all-round approach to computers.
- Computer studies for the 11-12 age group would facilitate the comprehension of algebra.

B. Placement of Computer Science

- More countries are now offering "computer science" as an optional subject at least at the upper secondary level (general and/or vocational). Where it is an option parallel to others (e.g. in the UK) pupils tend to choose it in preference to art, cookery, geography, etc. In other cases, positive efforts have been made to integrate computer science with other subjects (e.g. mathematics) provided the teachers were willing and properly trained. However, it has not been possible anywhere to make computer science a subject in its own right and compulsory for all.

C. Aim of Computer Science

- The aim is not to train computer specialists but to go beyond the general introduction (computer studies, see 1 above) and to deepen the basic knowledge of those pupils

who are particularly interested in computers.

D. Contents of Computer Science

- Here, too, one has to avoid too much specialisation as otherwise young people who have already studied computer science at school will not be flexible enough for the labour market.
- No uniform contents should be imposed for all, however, much will depend on local circumstances. (Programmes offered in the UK are a good example.)
- What matters is real life practice and not just theory, for instance, logic and arithmetic, architecture, system software, system design, approaches to programming (retrieval), comparative study of computer languages (there is controversy as to whether it is of any use at all to study a particular computer language), information and control technology and perhaps information theory, telecommunications, automation, electronics, simulations, principles of computer operations, practical applications and their influence on society.

E. Requirements of Computer Science

- Experience shows that it is necessary to prepare a proper but flexible syllabus and material which can be adapted to local needs. Teachers will need a constant supply of material describing relevant activities and developments.
- Teachers in charge of computer science require adequate academic and professional training (see 5 below) and should know about the possible uses of computers. Practical experience with computers would be helpful.
- Pupils often tend to be over-enthusiastic about computer science. They need a certain basic knowledge (general introduction) about computers before deciding whether or not to opt for computer science, otherwise they may be disillusioned. (The UK has experienced an explosion of pupil interest in computer science as an optional subject: 7,000 in 1974; 54,000 in 1981.)

3. Computer-assisted Learning (CAL)

A. Experience in Europe

- Computers have changed the world of work and the opinion held by the public as regards many subjects taught at school. As a result syllabuses will have to be changed.
- Bad experiences with programmed learning in the 1970s has led to a lot of scepticism as regards CAL.
- It is possible to use computers in all subjects (computers can even compose music) provided the teachers are properly trained. There is research on the best didactical use of computers and quality software (with good documentation) is being developed.
- The concept of CAL has changed over the last fifteen years. The teacher is now seen as an integral part of it and the cost of equipment has been reduced.
- There are two types of useful material: that for demonstration purposes and that for interactive use by the pupil.
- Teachers must adapt technology to education, not education to technology. Schools might ask industry to produce adequate material but it would not be good to have computers produced for exclusive use in schools.
- CAL still demands considerable financial resources and political will on the part of the authorities. To produce good material is difficult and expensive. Zero growth rates in Europe may, therefore, pose an obstacle to CAL.
- Experience with computers in the different subjects has to be realistic, otherwise interest is lost.
- CAL fails if imposed.
- Teachers must be involved in the development and design of CAL.
- Pupils, teachers or designers may be in control of the activity (there are good examples of all three approaches in Europe) but it is important to know why that person is in control.

B. Advantage of CAL

- Good or bad use can be made of CAL. If the right use is

made of it it can be a very useful learning and teaching aid.

- Work with computers helps to promote intellectual development of (ordinary as well as handicapped) children. The computer forces pupils to structure problem-solving efforts and imposes clear definitions.
- Simulation games by computer (e.g. ecologic or genetic processes in biology, elections in civics, construction of data bases in history) are quicker, cheaper, safer and often socially more easily acceptable than traditional experiments.
- Simulation games help to modernise curricula and to make them more relevant.
- Information retrieval via the computer is a good learning tool because it requires logical thinking.
- Computers assist the teachers in their tasks: text processing, data bank, etc.
- CAL facilitates interdisciplinarity.
- CAL may also help with remedial work.
- Computer-based learning environments facilitate access to mathematics.

C. The Teacher's Role in CAL

- Already television has changed the role of the teacher in the classroom and in society. CAL will alter it even more in the sense that teachers will no longer be the first source of information.
- There is no need to worry. CAL will not replace teachers. On the contrary, CAL will support them.
- CAL requires teachers to be even more professional.
- CAL will help teachers to develop new styles and skills.

D. Recommendations with Regard to CAL

- CAL must not be restricted to programmed learning. Genuine computer applications for teaching and learning purposes should be encouraged.
- Materials should follow closely the theory of learning so as to avoid a situation in which pupils can answer questions

but learn little. Group work by children should also be fostered.

- Computers should be integrated in teaching as a helpful method; different types of software should be used (simulation, calculation aids, data processing).
- Software should be flexible as regards to its use, as well as transportable, so that it may be distributed easily. This will help the teachers to continue to be masters of their own teaching.
- Schools should favour interdisciplinarity when introducing CAL.
- In simulations the ideology behind the different models should be clearly expressed. Simulations should nct be used to discontinue classroom practice.
- There should be more programmes in which the models are created and amended by the pupils rather than letting them just respond to altered parameters.

4. Pocket Calculators

- European experience seems to indicate that pocket calculators should not be used before children have acquired the basic elements of calculation; nor before repeated exercises involving pocket calculators have been made.
- In no case would pocket calculators render genuine computer studies superfluous, as some people tend to believe.

5. Teacher Education

A. General Principles

There is general agreement over the following principles governing initial as well as in-service education and training of teachers (INSET):

- All teachers should learn about the technical, methodological, and educational aspects of computers to remove the fear of computers.
- These efforts should build upon educational (pedagogical) theory; teachers should learn to choose whether the computer is useful to them.

- Software and curriculum material for use with teachers must be promoted. Far too little is offered at present.
- Teachers with a degree in computer science should assist in teacher education. Ideally every large school should employ one or two such teachers (but in many countries they can hardly be found).
- Teachers should learn to appreciate how the computer can influence their role.

B. Initial Teacher Education

- In the same way as their pupils, all future teachers should be given an introduction to computers and their possible use in education. At present very little is done in this way in European colleges of education, except, perhaps, in the case of future technical or commercial school teachers.
- Future teachers should also acquire sufficient competence to be able to amend programmes in simple ways (e.g. to change data) but they need not be expected to write their own programmes. (They should, however, be able to explain their needs to programmers.)
- Future teachers wishing to teach computer science should have a more in-depth education in computer science in addition to education in their chosen subject matter.

C. In-service Education and Training of Teachers (INSET): Present Situation and Experience

- Some countries, but not all, are offering INSET programmes to familiarise teachers with computers.
- In some instances teachers were taught to prepare their own software and teaching material.
- If teachers are involved in curriculum development they are more easily prepared to accept computers in education.
- Experience in the UK has shown that good INSET schemes produce an insatiable demand. (Teachers were even made to build their own programmes and to evaluate and disseminate them.)
- INSET is much more important than initial teacher education because the numeric proportion between active teachers and

teacher students is 90:10 and the present age pyramid makes it unlikely that many new teachers will be recruited within the next few years.

- INSET with regard to computers will require considerable financial outlay because of the enormous number of teachers to be trained.

i) Contents and Strategies

- Contents of INSET should show that the computer may be a useful tool in all subjects and illustrate its advantages.
- Contents of INSET should offer the same general introduction which is recommended to all pupils.
- INSET must never try to persuade teachers against their own will; neither must it be forced upon them from ministerial level.
- School-based INSET is helpful because it reaches more teachers than courses offered at some INSET centres.
- The best approach is to train selected teachers centrally, who would in their turn train at regional level and then these in their turn would train at local level. This model is popular, cheap and effective. It ensures local involvement and allows for local adaptations.
- INSET and curriculum development should go together.
- INSET might itself use the computer as a tool.

6. Research and Evaluation

A. The Situation as Regards Research

There is very little pure and academic research on computer-related instruction in Europe, but there is applied research in several countries.

B. Recommendations for Research

- Research has to bear in mind the operational aspects and should not be too difficult nor beyond the financial resources of schools.
- Research should consider children's needs. Teachers should adapt to them and learn from them.

- Research should be developed in co-operation with teachers in the classroom.
- More research is needed on the didactical use of computers in different disciplines.

C. Evaluation of Computer-related Instruction and INSET

- Often evaluation cannot take place, because there are no clearly stated objectives.
- A programme is considered successful if observation of children in the classroom shows that things have changed since the programme was introduced.
- Evaluation needs feedback from teachers. It should, therefore, be an integrated part of any project and become the responsibility of the teachers.
- Findings should be recorded, reported and discussed with all involved.
- Case studies might well prove more important than formal evaluation.

Concluding Remarks

Whether the picture which has emerged from the Frascati Workshop will change in the near future is difficult to tell. Lack of funds may be an obstacle to progress. Implementation of some of the recommendations then made would require not only funds but a change of attitude, which may be difficult to bring about. Ministerial decrees alone will not change established patterns of behaviour or mentalities.

Footnote

1. The Council for Cultural Co-operation includes: Austria, Belgium, Cyprus, Denmark, Finland, France, Federal Republic of Germany, Greece, Holy See, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom of Great Britain and Northern Ireland.

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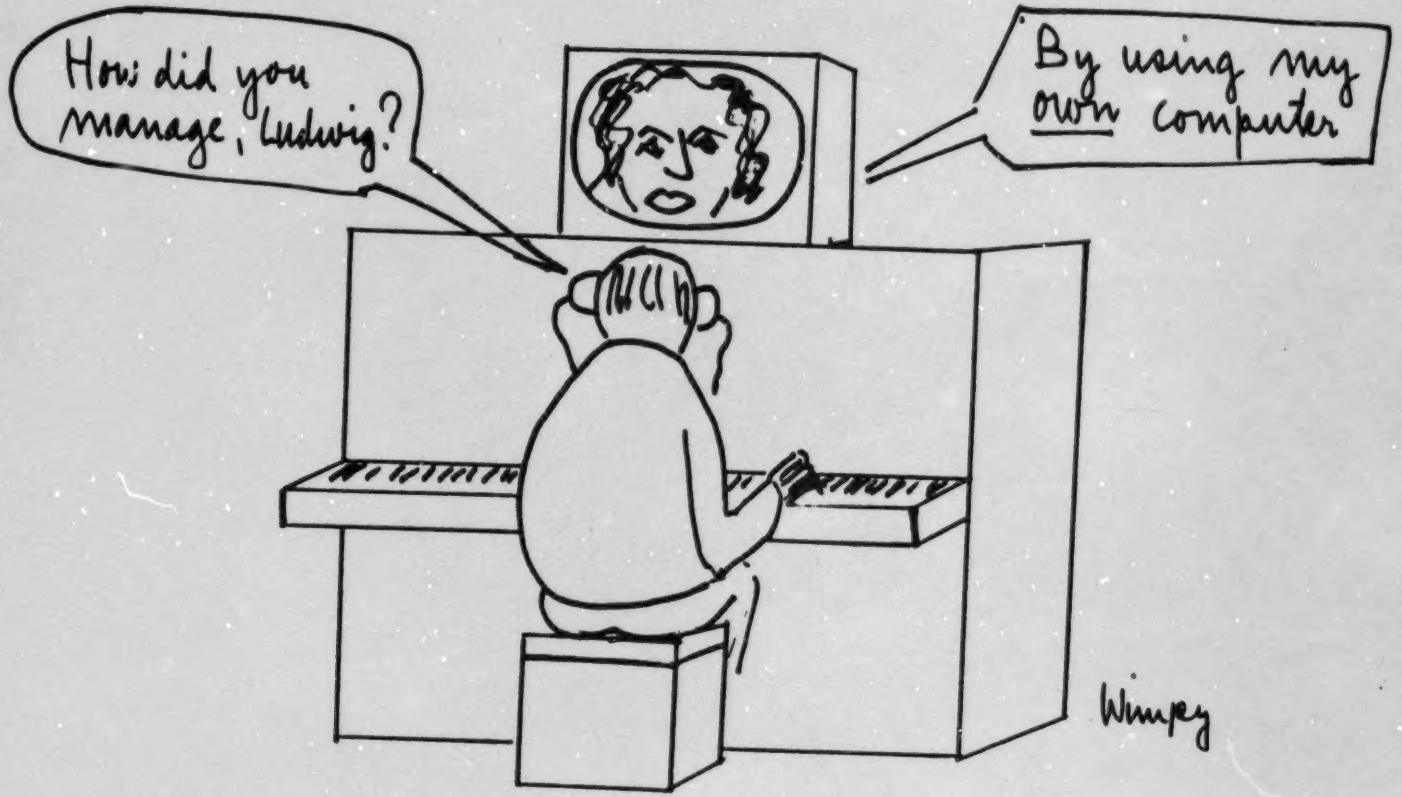

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COMPUTER APPLICATIONS IN HESSEN SCHOOLS

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The fact that an ever-increasing number of both teachers and pupils acquire home-computers privately and wish to use these as teaching aids indicates that the effects of micro electronics have spread as far as the school sector. This 'privatization' of information technology commenced years ago on a wide scale with the introduction of pocket calculators and is now continuing with the purchase of home and personal computers.

More than any group, adolescents are very interested in information technology and understand how to acquaint themselves quickly with the apparatus and learn how to operate it. A glance into a school's computer classroom will show just how involved, aims-oriented, and tenacious the pupils are in their approach to computers even in their free periods.

The outstanding achievements that pupils are capable of are illustrated by the projects pupils annually enter in the 'Youth Research' competition. In this competition, which takes place for the 18th time this year, national and state winners are judged in different project areas.

The Hessen Ministry of Education was able to award prizes to two groups concerned with computer technology. One group had managed, using only simple aids, to construct a computer graphics system for the blind. In order that this project could actually be sure to be useful for the target group, the pupils worked very closely with blind people from the outset. An impressive example, I feel, of technical and yet also of social 'involvement' by young people.

I wish with these introductory remarks to draw your attention to two aspects of computing in schools:
Independently of any educational-political measures, of which I

shall speak below, information technology is gradually gaining ground in schools via individual initiatives taken by teachers, pupils, and parents. The effects of micro electronics on the private sphere in this fashion touch tangently on everyday schooling. Those responsible are thus faced with the problem of defining modernization and installation policies which can fill obvious gaps in school equipment.

On the other hand, pupils show astonishing motivation, creativity and a preparedness to learn in their involvement with computers at schools. The oft-mentioned 'distance from technology' is, at least here, hardly noticeable. However, parents and pupils do not expect just games from the application of computers. Rather - and justifiably so - they expect up to date, and in view of the difficult situation on the labour market, increasingly job-oriented contents to the lessons.

Introduction to the School Subject: Informatics

The effects of recent information technology on the professional and employment worlds, on science, and on the economy cannot and must not remain without consequences for the educational sector. For example, since 1972 the Standing Conference of State Ministers of Education and Cultural Affairs has been trying to influence the promotion and the formation of the new school subject of *informatics*. In the Federal Republic of Germany this subject is given a key role in adjusting the canon of subjects to the needs of a highly technologized society. In the meantime, informatics has become an independent and regular teaching subject in Senior High Schools (with the exception of Schlesswig-Holstein and with restrictions in Hessen).

Although the concrete development of informatics as a subject was made on a state level and was furthered by school or prototype trial projects, a consensus at federal level has now been reached both on the knowledge to be communicated by this subject and on the departmental independence of informatics.

From the clarifying process of the last ten years the following objectives can now be judged as fundamental to informatics:

- a familiarity with algorithms and their programming
- an insight into the construction and functioning of a computer
- a knowledge of the applications and effects of informatics.

Informatics lessons based on the above presumptions are expected to promote the following abilities in the pupils:

- ordering and organizing abilities, such as find expression in planned and systematic work
- precision in thought and formulation
- creative thought and a concordant problem-solving ability
- algorithmic thought, oriented towards both procedures and transformational structures
- structured thought, i.e. the ability to recognize structures within complex constructions
- self control, i.e. a constructive and critical attitude towards one's own activity.

Not only schools offering a general education but also vocational schools lay particular emphasis on mediating precisely these abilities. These abilities count as the basic training, to which, according to the type of school, a further, (e.g., job-oriented program) training can be added.

In the vocational school sector the contents of data processing/informatics are suggested by Federal Guidelines and are laid down in the curricula for each particular sphere of job training or type of school. The present suggestions on the curricula and the guidelines differentiate between the demands of business schools and of technical and engineering schools within the vocational school sector. The different forms of the application of micro electronics in office organization and communication, on the one hand, and in technology, design, and construction, on the other hand, necessarily lead to a different choice and weighting of the contents and aims of teaching.

Educational-political measures are not, however, restricted to the introduction of informatics as a school subject. The technical and social changes following in the train of modern information technology are so vast and far-reaching that young people cannot acquire the tools on which to base their chances for a future life by relying solely on the contents of one subject.

Micro Electronics in Other Subjects

In Hessen certain contents and methods of data processing and

their application and social relevance can be taught outside informatics as a separate subject, as well as in other subjects, types of schools and school levels. For example:

- in the subject polytechnics, which is supposed at an early date to communicate a knowledge of and a relation to the world of employment to pupils in Junior High Schools
- in the optional compulsory subject in Junior High School, which schools can use for such a self-chosen range of subjects
- in Mathematics at both levels of High School, a subject in which computer use is widespread as a motivating enrichment of the lessons
- in Social Studies, where in particular discussions of the consequences of micro electronics can be conducted (e.g. the question of data protection).

Pointing thus to this diversification of possibilities may perhaps present a false impression of actual school practices. Information technology has up till now only been treated as a topic in certain branches of the schools and most certainly not in all schools. There are two reasons for this:

1) Teachers of information technology can only be trained sporadically. Owing to the low number of newly recruited teachers in the 1980s, teacher training in this area will hardly lead to improvements.
2) The schools can only gradually be equipped with the necessary computer apparatus because of the considerable investment costs entailed.

Equipping Schools with Computer Technology

It is generally assumed in the Federal Republic of Germany that a lesson in informatics misses its point if the pupils cannot undertake practical work at a computer. In the last five years contributions by the State of Hessen, the district school financers, and the parents' associations have enabled most schools with a Senior High School to install computer classrooms. Whilst in 1977 only 117 'Gymnasiums,' Comprehensive Schools, and Vocational Schools had at least one computer, by the end of 1982 231, 47% of these schools, could employ computers for teaching purposes.

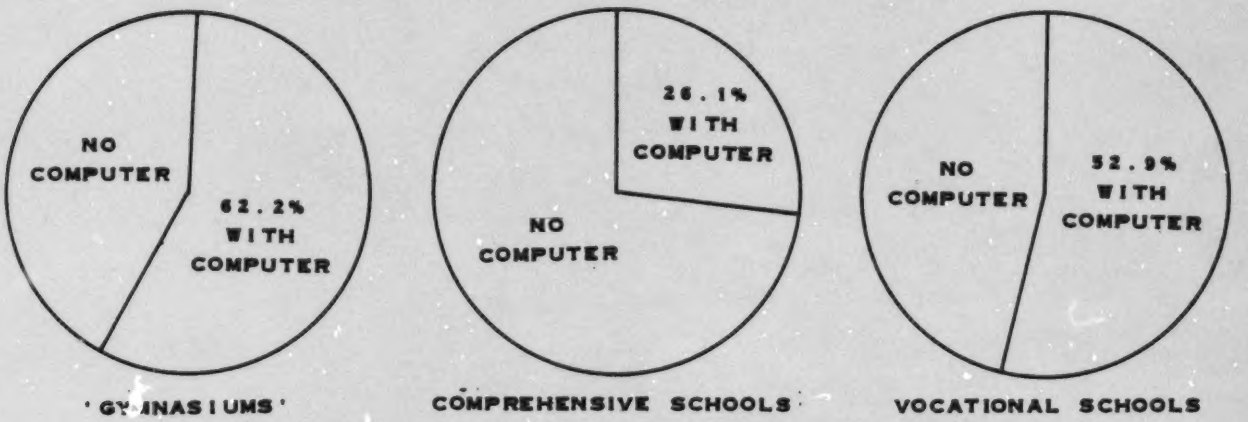
As a percentage of the total number of schools in Hessen for the above schools the following figures can be arrived at:

- 62% of the 'Gymnasiums' and in all 71% of Senior High Schools

have their own computer

- 26% of the Comprehensive Schools are equipped with computers, and in those cases where these schools have a Senior High School, almost all of them possess a computer
- 53% of the Vocational Schools are equipped with computers, whereby almost all Vocational 'Gymasiums' and Senior Technical Schools have computers.

Fig. 1: Equipment of schools with computers in percentages



These figures alone say little about the usefulness of computer systems in lessons. In Vocational School classes there are frequently up to 28 pupils and, in schools offering a general education, the voluntary work groups and beginners courses have between 15-20 pupils to undertake the necessary interactive studies with a computer, several people must be employed to run the computer. Taking pedagogic requirements and financial resources into account, in Hessen we strive to employ one such person for every 2-4 pupils. Schools that already utilize computers in instruction have on average 4.5 such people.

Table 1. Average number of jobs on the computer in schools with computing equipment.

Type of School	Average Number of People Employed on the Computer
Total	4.5
'Gymnasiums'	4.3
Comprehensive Schools	2.7
Vocational Schools	5.6

Computer Application in Schools Offering a General Education

In Hessen informatics is considered a school subject for Senior 'Gymnasiums' (according to the Law of 11th June, 1982). It belongs to the field of mathematics and natural sciences and can be chosen as the third or fourth subject in the 'Abitur' (University Entrance Examination).

Up till now the Minister of Education has granted, at their own request, permission to 15 schools to undertake school trial projects in Informatics. For the duration of a four-semester basic course in Informatics the schools were thus able to test the design of a course-structure plan for informatics.

The development in Hessen of informatics teaching generally was predominantly influenced by two prototype trial projects: 1) PROKOP - Computers as an aid for the pupil in active learning, a project to test problem-oriented computer use in cooperation with teachers; 2) IDA - Integrated Application of Data Processing in schools.

On the basis of the experiences gained in these prototype trial projects and from the material produced for them, it was possible to further the use of computers in teaching in all schools possessing a computer. After all, 120 of these schools offer Informatics classes in the form of voluntary work groups or as an optional compulsory subject in Junior High School.

Fig. 2: Number of schools according to subject-specific computer use.

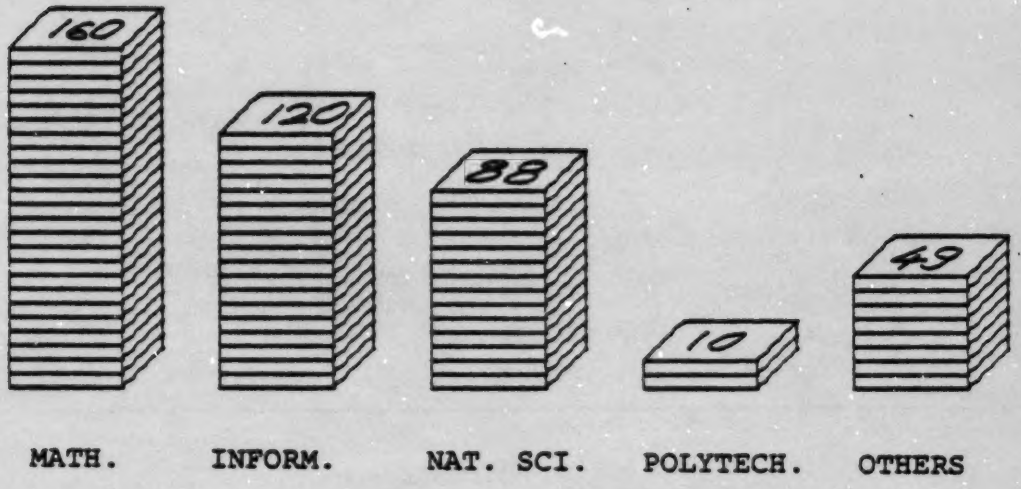


Table 2: Number of schools according to subjects, in which computers were used.

Subjects	Junior High	Senior High
Mathematics	87	141
Informatics	60	107
Natural Sciences	46	82
Polytechnics	9	7

Computer Application in Vocational Schools

More than half the Vocational Schools are able to use computer technology in career-oriented teaching. Nevertheless, many schools lack the prerequisite hardware and software if they are to keep pace in the lessons with changes in technology. In those cases in which computers and micro processors can be used to realize the teaching aims prescribed in the curricula, the following main points dominate in terms of methods:

1) The use of computers as tools (predominantly with BASIC, occasionally with PASCAL, COBOL or FORTRAN) with which to mediate the fundamentals of data processing and programming knowledge.

2) The application of computers as an aid in problem solving in wage and finance accounting, in stocktaking, in statistics, for design in engineering production, and for hotel billing etc.; by means of commercially-acquired programs or ones produced at the school. Data from these areas can be worked on by pupils at visual display terminals.
3) The computer as an aid in the simulation of both commercial applications ("teaching office") and of planning games in business and economic decision-making.
4) Teaching programs for practice and autodidactic work are offered with the computer (computer-assisted teaching).
5) Computers are used as a tool in technical functions for both control and regulatory procedures. With the transition from 'mechanics to electronics' and from 'analogue to digital technology' the job-oriented Vocational Schools have increasingly conveyed teaching aims on hardware (micro electronics, measurement technology) and control computer technology to their pupils.

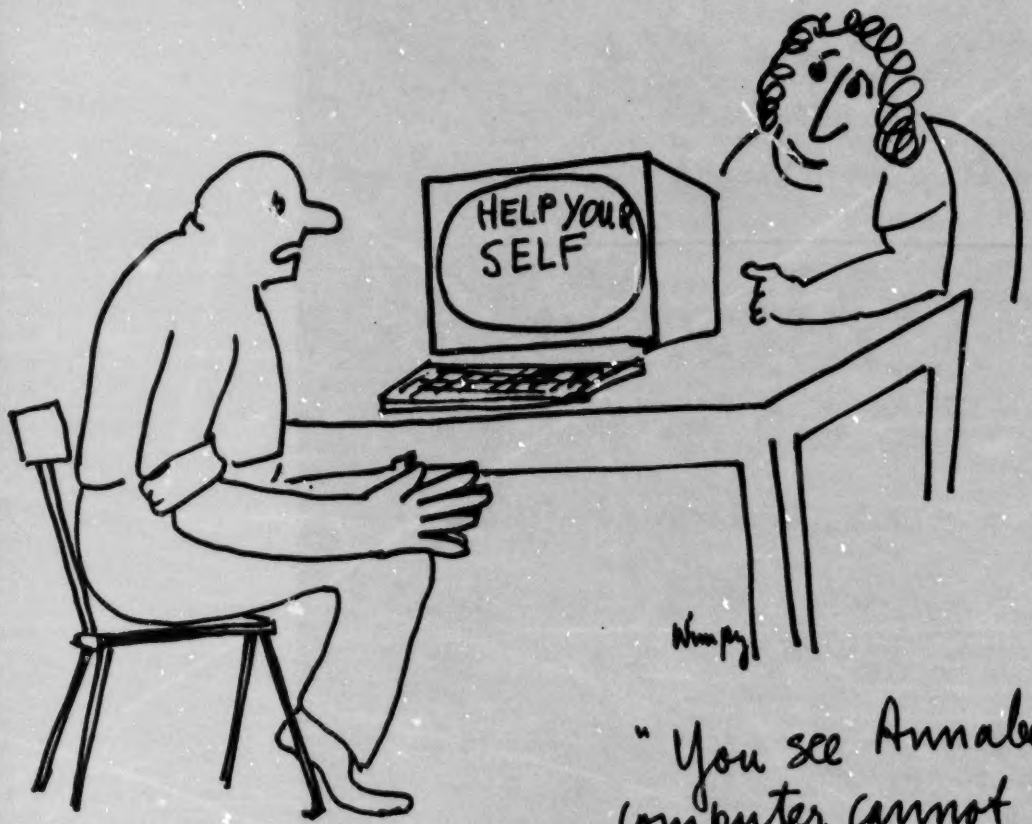
So far computers have been applied in job training for the business sector and in the technological professions (e.g. information technicians) as well as in Business 'Gymnasiums' predominantly with the emphasis on Technology and Economics and Administration.

Summary

To summarize briefly our experiences in Hessen, in the 1970s the Hessen Ministry of Education had already started to gain well-founded experience in using computers in schools by means of school and prototype trial projects. On the basis of this knowledge, a wide-spread use of computer technology in all schools with a Senior High School has been furthered.

In view of the limited financial resources, however, a state-wide equipping of schools with the necessary apparatus has evolved only step by step. The same holds true for the training of teachers. In the context of the training quotas at our disposal, only 120 teachers qualify in the basics of information technology annually.

I see it as the State of Hessen's main task in the coming years, in joint effort with the towns and districts responsible for the equipment of school buildings, to further develop teaching courses and to provide the schools with contemporary equipment. The imminent introduction of videotex (visual display texts) and of cable media in the Federal Republic of Germany will provide new impulses to technological progress with new demands made of the education sector.



"You see Annabel even the computer cannot explain what LOVE means."

ANALYTICAL CRITERIA FOR MICROCOMPUTER-BASED SIMULATION/GAMES

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Professionals roles in education are characterized as practitioner, researcher and developer, and any one professional can have more than one role. Practitioners are expected to operate in a variable and real world and try to control those events which would promote skills, knowledge, and attitudes. Researchers have uncertain theory to guide them as they try to advance understanding. Developers have tasks to perform which are not constrained by the real wold of students and schools nor the necessity of adding to present understanding. Developers attempt to provide instructional materials and activities for use by practitioners which, it is hoped, reflect the accomplishments of researchers (Schwen, 1977). There is a knowledge-production-to-use continuum implied by these roles. These roles and the different products of educational inquiry that they imply have been suggested as appropriate ways to define the missions of teacher educators by the American Association of Colleges of Teacher Education (Howsam et al., 1976).

Having all three roles to satisfy leads to diverse perspectives and varied expectations. In the last few years, I began to use microcomputers and was struck by the different experience they provided from the simulation/games I had used with stucents. As I read available reviews, I was often disappointed because I found them not very helpful to my understanding of the programs they reviewed. Their checklist approaches were usually not appropriate. I found the reviews neglected either social studies or social science or simulation/gaming or, in some cases, computer-based education criteria. Furthermore, the audiences assumed by these reviews were relatively unsophisticated practitioners looking for

materials beyond drill and practice in the social studies area, which had little of even that mode. As someone who sees himself as a sophisticated practitioner of simulation/gaming, a developer of some simulation/games, and a sometime consumer and retailer of research about simulation/games in my classes, I decided to investigate the possibilities for improving the analysis of microcomputer-based social studies simulation/games.

In this paper I will try to identify analytical criteria gleaned from reading, practice and reflection. These criteria may help practitioners make better decisions. They may help developers clarify their tasks in the development of microcomputer-based social studies simulation/games. And finally, since one discipline's assumptions are another discipline's objects of inquiry, the suggested criteria may lead to some research questions.

There are several sources from which criteria might be derived. This paper will focus on those aspects of simulation/games which might best illuminate ways to make decisions about microcomputer-based social studies simulation/games. Nevo (1983) notes that "known standards set by experts or other relevant groups or the quality of alternative objects" can be bases for evaluative criteria. Thus, only areas which might supply criteria for analysis of microcomputer-based social studies simulation/games will be explored. These areas include research and evaluative literature about simulation/games, instructional design and instructional psychology, as well as the literature of the social studies.

The following questions will serve to focus this inquiry into microcomputer-based social studies simulation/games:

1. What are microcomputer-based social studies simulation/games?
2. How effective are simulation/games?
3. How effective is computer-based education?
4. How are simulation/games reviewed?
5. How is microcomputer courseware reviewed?
6. What can be learned from instructional theory about microcomputer-based education and simulation/games?
7. How might microcomputer-based social studies simulation/games be reviewed?

The answers to these questions may help practitioners, developers, and researchers in their uses of microcomputer-based social studies simulation/games.

1. What are microcomputer-based social studies simulation/games? Since several disciplines are being used to inform this effort and there are intranational and international differences in the use of these terms, some definitions and understandings may be useful. Among these diverse perspectives, several different uses are made of the terms simulation, games, gaming and simulation/games (Association for Educational Communications and Technology, 1977; Gibbs, 1978; National Council of Teachers of Mathematics, 1981; Seidner, 1976; Stadsklev, 1974).

A simulation/game is an instructional strategy which uses simulations of social science models designed or adapted for instructional purposes. These simulations often have a game-like aspect. As an instructional strategy, simulation/games usually involve an entire class in active roles and, until recently, did not usually employ a computer.

Simulation/games differ from *simulations* and *games*. Schools use *games* for drill and practice and sometimes for amusement. *Simulations* have been rarely used in the social studies since they are usually used to demonstrate complex problems for analytical or predictive purposes as in science classes. *Simulation/games* differ in that they are instructional simulations which often have a game-like aspect. Roleplay differs from simulation in that roleplay is usually less structured and roles are taken by only a few members of the class. Also simulation/games are often based on social science models simplified for instruction. A further delineation is that this paper will contrast microcomputer-based social studies simulation/games with classroom simulation/games. These have also been called interpersonal ascendant simulations and machine/media ascendant simulations (Twelker, 1969).

Although each classroom simulation/game may have a different process, generally simulation/games can be thought to have a common format as an instructional strategy. Weil and Joyce (1978) have

suggested that all instructional simulations should have the following phases: an introduction in which topics and concepts as well as an overview are given; a training session in which rules, roles and some practice are supplied; the operation of the simulation/game in which participants play the game with help from the person(s) leading the simulation/game; and finally, a debriefing phase in which summary and analysis occur.

Although there have been no particular characterizations of microcomputer-based social studies simulation/games in the literature, usually they involve solving a particular problem through repeated trials. On the basis of these trials, students usually can infer enough about the algorithm upon which the simulation/game is based to successfully solve the game portion of the simulation/game. The solution to the game should require successful and appropriate decisions about the simulated social science model.

2. How effective are simulation/games? Reviews of simulation/games have emphasized different aspects of evaluation. Roberts (1976) supplies a comprehensive review. In 1974, the SSEC summarized data which it had gathered in a multi-state survey of non-computerized simulation/games with the recommendation that "many more teachers would find it worth their while to explore the possibilities of using simulation/games" (Chapman and Cousins, 1974). Other reviews examine the components of simulation/games (Gillespie, 1972), simulation/games as part of a curriculum design process (Gaines, 1973), or simulation/games from the viewpoint of a simulation/game designer (Stadsklev, 1969). Several reviews of research, research papers, and reviews of simulation/games have been published in Social Education (Bagley, 1973;Pierfy, 1973; Henderson and Gaines, 1971; Wentworth and Lewis, 1973). However, thus far microcomputer social studies simulation/games have not been evaluated in the literature.

An extensive literature supplies many studies of non-microcomputer simulation/games. Studies of simulation/games are difficult to conduct. Few studies have been done which compare the effects of several simulation/games with one group of people, one simulation/game with several groups of people, or several simulation/games with

several groups using the same measures. However, even where such studies have been conducted there are problems of generalizability, since no participant will experience and therefore respond in the same way, and in whole class simulation/games it is unlikely that the same result would occur with different classes. Thus, conclusions about simulation/games are more tentative than about other instructional techniques (Pierfy, 1977). What follows are some relatively safe generalizations about simulation/games. They are based on an examination of several studies and, therefore, are qualified:

1) Simulation/games increase motivation and interest. Although there is some disagreement about why simulation/games increase motivation, several studies report this result (Bredemeier and Greenblat, 1981).
2) Simulation/games, in general, are no more or less effective in enhancing cognitive learning than other instructional strategies. Although some studies report less cognitive learning, there are others reporting greater cognitive learning than with an alternative instructional strategy (Greenblat, 1982).
3) Simulation/games may produce better retention than other strategies. (Greenblat, 1982) The results that support this conclusion are indicative but notable since computer-based education has not been able to substantiate such a claim.
4) Simulation/games are reported to influence attitudes in some instances. The results here are mixed and no conclusions can be reached (Orbach, 1979).

3. How effective is computer-based education? Another area from which criteria for the analysis of computer-based social studies simulation/games might be derived is computer-based education. For some reason, most meta-analyses have combined computer-managed instruction, tutorials, and drill and practice exercises. Among the research summaries of computer-based education are a small percentage of studies on the use of simulation/games. Nevertheless, some

of the findings are those from which analytic criteria might be derived.

Computer-based education leads to higher scores on criterion tests. It remains to be seen if more conventional (albeit not more appropriate) measures such as achievement tests would yield similar responses. Analyses conclude that computer-based education yields gains of one-half of a standard deviation at the elementary level (Grayson, 1982), one-third at the secondary level (Kulik, Bangert and Williams, 1983, p. 22), and one-fourth at the college level (Hall, 1982).

Computer-based education appears to be more efficient. Claims are made that learning time is reduced forty to fifty percent when compared with traditional instruction (Hall, 1982).

Computer-based education seems to improve student attitudes toward computers and subject matter. Although these results are widely reported (Bracey, 1982; Hess and Tenezakis, 1973; Kulik et al., 1983), it is difficult to determine the source of this socio-affective outcome. Some studies in progress (Bracey, 1982) suggest that a student's feelings of efficacy as a learner or general locus of control may be improved by computer-based education.

Computer-based education may increase retention. Although some claim that this outcome is substantiated (White, 1983; Hall, 1982), other analyses suggest slight positive results (Kulik et al., 1983).

Computer-based education may be feasible for small groups of students as well as individuals. This was observed at Columbia University's Electronic Learning Laboratory (White, 1983) and is congruent with other reports. One study concludes that "as many as four students could use a CAI terminal simultaneously and learn as much as students working alone" (Okey and Majer, 1976).

4. How are simulation/games reviewed? There are few large sets of criteria for the analysis of simulation/games. Horn and Cleaves (1980), the most complete single source of analytic criteria, contains formats suggested by the editors and other formats proposed by the individual essayists and reviewers. The criteria although common to all simulations reviewed in evaluative essays are applied differently and selectively by each of the authors.

However, it can be concluded, that the following skills and activities are appropriate categories from which criteria for most simulation/games might be formed:

Information Processing - analysis, planning, gathering information

Proposals and Lawmaking - opposing proposals, voting on proposals, writing proposals

Group Activities - debate, discussion, problem-solving

Human Relations - competition, interviewing, forming coalitions, persuading

Role Playing - as an individual, a group role, a work function, switching roles

Resource Management - survival, maximizing resources, managing resources, trading resources

Evaluation (exclusive of debriefing) - self, by peers

Other criteria include simple continua dealing with model validity, flexibility, clarity of rules, depth of content and quality of accompanying materials.

Individual evaluative essays also suggest some particular criteria for analysis. A review of ecology simulation/games rates these simulation/games on the extent to which content, awareness and social skills might be learned (Schaefer et al., 1980). An economics evaluation essay classifies simulation/games by how much they promote competition, compromise and cooperation (Pascale and Ehrman, 1980). The "percentage of time allocated to affective considerations" was used to classify simulation/games about energy and environmental quality (Bottinelli, 1980). Futures simulation/games were rated by the values promoted (Plummer, 1980). A review of simulation/games on the topic of international relations suggested that there is an inverse relationship between flexibility and abstraction (Suransky, 1980). In another review, the theoretical schools represented (values clarification, reality therapy) became the basis for classifying self-development simulation/games (Farra, 1980).

5. How is microcomputer courseware reviewed? There are as many systems for reviewing software as there are for reviewing simulation/

games. Most of these software review systems can be categorized as consumer information systems and/or general review systems to be applied by the consumer. A second level of review systems are those designed to be applied by review teams but which use a common format for all courseware. A third level would use specialized formats for different instructional models applied by review teams.

There appears to be an anomaly in the conventional wisdom about currently available courseware. On the one hand, many would agree with the assertion that "95 per cent of all the programs carried should never have been offered for sale" (Grayson, 1982). On the other hand, "children in the Computer-Assisted Tutoring System at Teachers College have worked eagerly on a software program that adult evaluators said was quite awful" (White, 1983). Similar successes were reported by early users of person/ascendant and machine/ascendant simulation/games.

Consumer information and general review systems can be found everywhere. The consumer information systems are filled with shibboleths about not purchasing any hardware until one has decided which software meets one's needs and the importance of purchasing enough memory. Educational consumer information review systems are a little more helpful. These include information about the availability of previews, money-back guarantees, easy backup of diskettes, and field-test data (Electronic Learning, 1982b). General review systems are also widely found. They seem to be based on rather simple, descriptive and general models of instruction. Some general review systems criteria are those which might be used to select any curricular materials. Other criteria which are based on the particular capabilities of the microcomputer can be helpful but are likely to be applied rather haphazardly (Electronic Learning, 1982c). Review systems, both consumer and general curricular or simple instructional design, are necessary and helpful but probably should not be the only guides to a decision.

The second type of review system is more useful since teams of experienced professionals can apply more sophisticated criteria to courseware. The review systems are usually based on the application of an evaluator's guide by a team of professionals. The Northwest

Regional Education Laboratory system attends to the potential of the microcomputer more than other review systems. This review system is based on a large and well-documented guide (Microsift) which was nationally field-tested (Marler, 1981, p. 17). Similarly, EPIE and the Microcomputer Resource Center at Columbia University sponsored a study to develop a similar instrument. This instrument seems to lean more heavily than others on ideas from instructional design and instructional psychology. Some aspects of this study (Cohen, 1982) can be seen in the EPIE and Consumers Union Micro-Courseware PRO/file and Evaluation review system. A third system, the CONDUIT review system, tends to be used to describe materials for the college level. The CONDUIT system attends to the concerns of the scholar, the author as communicator, the teacher, the student and the computer specialist (Anderson, 1980). These are the three most complete review systems, but they provide few explicit criteria for analyzing microcomputer-based social studies simulation/games.

6. What can be learned from instructional theory about microcomputer-based education and simulation/games? Instructional design and instructional psychology both can make contributions to understanding the microcomputer-based social studies simulation/game. Martorella (1982) delineated the contribution they can make to text design. As Bunderson and Faust (1976, p. 59) have noted "whenever emphasis is placed on hardware technology or its design and development the artistic approach is easily adopted. This has been true of the field of CAI. Institutions or organizations that have focused on the development of interactive graphics, simulations, and gaming have tended to ignore principles of systematic instructional development and to focus on the affective and aesthetic qualities of their product." The following discussion of possible contributions is meant to be indicative and cannot claim to be more than a sample of possible analytical criteria.

Although it has roots in educational psychology, instructional psychology is a relatively new and changing field. Over the past fifteen years it has moved from postulating hierarchical structures of learning to using artificial intelligence models to understand learning (Menges and Girard, 1983). Instructional design has been on

the scene for many years in various guises, but the Journal of Instructional Design was only begun in 1977. Together these disciplines can be characterized as the sources for instructional theory. In turn, instructional theory has been the single most important source for conceptual developments in courseware for microcomputers. From this literature, some further criteria for practitioners, developers and researchers may be gained.

Roblyer (1981) has observed that although "selecting optimal sequences of learning events has by no means reached the state of scientific procedure, knowledge of learning theory does play an important part. This knowledge is lacking in most programmer-designers working in the field today, although the knowledge is readily available." When Roblyer is noting the lack of learning theory, she is particularly concerned with its application in instructional design. Although recent theories proposed by instructional psychologists have not yet had the effect of those instructional psychologists writing in that field for several years (Braden and Sachs, 1983), instructional designers as demonstrated by Wildman and Burton (1981) have sought to integrate instructional psychology into their decisions for the design of instructional systems. Consequently, much of instructional design attends more rigorously to instructional psychology than social studies text materials as noted by Martorella (1982).

Gagné is the most used instructional theorist within the field of instructional design (Braden and Sachs, 1983). Wager (1982) uses Gagné's events of instruction to suggest an algorithm for simulations. He applies this and other algorithms to the design of computer software. As Gagné and Briggs (1979, p. 157) and Wager (1978) note, not all nine events are necessary in any lesson and therefore Wager uses those he judges most relevant to simulations. Wager says that "this type of program is often used to teach the relationships between variables by the 'discovery' method" (Wager, 1982, p. 266). Typically, according to Wager, a stimulus is presented, a response is elicited, and feedback is presented to the learner according to an unknown algorithm. The algorithm modifies the stimulus as well as provides other feedback which the learner must ultimately use to

solve the simulation.

Graphics are lauded as having great potential for computer-based instruction. Merrill (1981) applies Gagnē's domains of learning as organizing theory to provide guidelines for the use of graphics in instruction. Dwyer (1978) treats the same topic in a textbook which cites over 650 studies from a variety of nearly as many researchers. These sources are representative of those applications of instructional theory available to enrich the ubiquitous software criterion which typically asks whether or not graphics are used well.

Learning theorists with various perspectives can illuminate issues in the design and use of microcomputer-based social studies simulation/games. Davis (1980) postulates frames (an idea similar to Piaget's schema) which are structures representing information. These structures can be built up and retrieved from memory as needed. He states that their existence can best be demonstrated in mathematics as students make mistakes and reveal idiosyncratic structures. Allen (1975) eclectically combines theories and aptitude-treatment interaction studies to develop prescriptions in instructional design for students with higher or lower mental abilities. Gropper (1976) suggests that too many instructional designers are communication specialists who emphasize stimuli rather than learner responses. As part of a response-oriented media selection model, he makes some sensible prescriptions for the materials and processes which should accompany the media he classifies as active carriers, simulations and computer-assisted instruction. Jay (1983) presents some specific and sensible prescriptions for courseware design and evaluation based upon human information processing abilities. Tennyson (1981), while noting that cognitive psychology has presented a minimum of information-processing theory for instructional designers, asserts that principles rather than intuition should guide the design of computer-assisted instruction programs. For example, several review systems ask whether learner control of a program is part of a software package. Tennyson points out that studies have demonstrated that learners frequently terminate the program before they have attained the program's stated objective. Tennyson shows how a learner self-

assessment component can remedy this situation.

Gagné classifies simulations as intellectual skills since he sees them as the higher order rule-learning component of that domain. Critics of his theory (Strike and Posner, 1977) have suggested that the learning hierarchy approach may not reflect the conceptual structure of content or individual objectives. It may be suggested that simulation/games, either person/ascendant or machine/ascendant, might be classified as part of Gagné's cognitive strategy domain of learning (Gagné, 1972b, p. 4). Although he seems to reserve this domain for the production of novel solutions, the processes described seem to correspond to what might occur during the reflective debriefing of a simulation/game. Since Gagné's domains of learning and events of instruction remain important instructional design principles, this classification may be important for both developers and researchers.

Alternative theories about problem-solving behaviors have tended to use cybernetic or artificial intelligence theories to suggest models. Newell (1982) compares paleontology to computer science by noting that paleontology's "major conceptual advances occurred by stumbling across the bones of immense beasties" rather than through theoretical prediction. He believes that some advances in artificial intelligence may also result from practice rather than theory. The foregoing is not intended to suggest that artificial intelligence does not supply useful notions. A tutorial (Stefik et al., 1982) on techniques of expert problem solving systems collates several notions useful for developers and researchers. Greeno (1978) applies concepts and methods of cognitive psychology and artificial intelligence to the analysis of problem solving. Thus, artificial intelligence finds many models for problem solving or inquiry. Traditionally, at least for pedagogical purposes, the social studies has posited a method of inquiry or problem solving. Strike and Posner (1977) discuss the epistemological position that the above approaches demonstrate and contrast it with the traditional position that the social studies has espoused.

7. How might microcomputer-based social studies simulation/games be analyzed and reviewed? Combs (1978) predicted that micro-

computers would lead to greater use of simulation/games. A Delphi study of trends in the production of instructional materials confidently predicts that simulation/games will increase in popularity with the proliferation of microcomputers (Dayton, 1981). Both predictions imply that all three professional role groups will need better analytical criteria.

There are three issues yet to be discussed. First, the idea that special criteria can be used is explored. Second, the use of social science models is identified. Third, some examples that justify the use of microcomputer-based social studies simulation/games are discussed. In conclusion, some question which might provide a framework for the development of criteria are offered.

Several writers have suggested ways to improve the review of courseware. Cohen (1983) has suggested that a distinction be made between general instructional attributes and those specific to the design of microcomputer courseware. She supplies some generalizations to be considered in the design of courseware. Roblyer (1981) compares the PLATO and Standford/CCC models for courseware design. Besides noting some essential criteria, he suggests that differential criteria are also useful. It is suggested that besides the local program criteria that practitioners often use, special criteria be developed to reflect the particular design requirements of simulation/games.

The following lists of questions can be used to develop criteria for the analysis of a microcomputer-based social studies simulation/game.

A. Practitioners who are new users of microcomputers in classrooms would want to know:
   1. Where does it fit in the curriculum?
   2. Are there enough support materials so that other students are occupied profitably?
   3. Can all students use this software with understanding?
   4. How much content does it carry?
   5. Which classroom organizational changes must be made in the use of this program?
   6. How well do students learn when this software is used?

7. What extra work for the teacher is involved in the use of this software?
8. Besides information from student use, what information is available from teacher use of this software?
9. On the descriptive level, what information is available on previews and copying policies?

(In addition there is the general level of instructional and courseware criteria which assumes some sophistication of practitioners.) Questions addressing instructional and courseware criteria might include:

10. How does this program compare in learning efficiency with instructional alternatives?
11. How does this package affect attitude toward a subject?
12. Can groups of students or a whole class efficiently use this software? With what results? Under what conditions?
13. With which instructional strategies might this software package be coordinated?
14. What record keeping is supplied by the program?
15. Is there an instructional design theory for this package? If so, what are its assumptions and what does it predict as a result of using these materials?
16. What use is made of the graphic capabilities?
17. What use is made of interactive capabilities?
18. Are other instructional materials available for teacher as well as student use?

The above list suggests questions to be asked of all microware. Sources cited would indicate specifics.

A third list focuses on criteria specifically applicable to microcomputer-based social studies simulation/games:

19. What is the model this simulation/game teaches?
20. Which social science concepts and generalizations might be taught by using this program?
21. How many and which variables are managed in this simulation/game?
22. How is the algorithm flowcharted?
23. How much role flexibility or adaptation is possible?

24. What kind of information processing or thinking skills are used by learners?
25. What provision is made for evaluation of the learner by the program, the learner by peers, or the learner by him or herself?
26. What kinds of group skills might be promoted by the use of this package?
27. Which special criteria might be applied to a class or category of simulation/games?

This third level should supply enough analysis to satisfy most practitioners.

B. Developers and researchers need information from a different perspective. They will want to answer the following questions about microcomputer-based social studies simulation/games as an instructional strategy:

1. Which are most effective to teach particular objectives?
2. How can graphics theory best be applied?
3. Which interactive techniques are most useful for this strategy?
4. How many and which variables can be managed by which learners?
5. Is there a model for adapting board games to this strategy?
6. Is there a model for adapting person/ascendant, whole class simulation/games?
7. How effective would a branched dialogue be for debriefing?
8. Given that diskettes can be used to store student responses in uncoded (albeit limited) and coded form and these responses could be transmitted, what might be learned from these data?
9. Since this strategy, at present, seems to lack the affective risks of people/ascendant simulation/games, what effect is there upon cognitive and affective outcomes?
10. Do current prescriptions from research about graphics need to be revised in this medium and/or strategy?
11. Current social studies texts use more than fifty per cent

graphics up to age nine. What mix of graphics to text is most appropriate for different ages using this strategy?

12. Can artificial intelligence expert problem solving systems serve as models for this strategy?
13. How might videodiscs be integrated with this strategy?
14. What effects might students using personal or school micro hardware and software at home have?
15. Considering that there are several frame games simulation/games that can be used with a variety of concepts and topics now in the person/ascendant mode, can similar frame games be developed for this strategy?
16. Simulations have been played internationally but microcomputer technology now makes this option available to all. What effects might this development have?
17. What changes in school organization might this strategy and its accompanying technology cause?

As researchers, developers, and practitioners begin to address these questions, more analytical criteria will emerge.

My experience has been that many in education consider simulation/games as games and therefore frivolous and unnecessary activities. Denenberg (1982) suggests similar attitudes exist in higher education. However, there are several justifications that developers and practitioners might use for microcomputer-based social studies simulation/games. Simulation/games can be among the most easily managed forms of action learning (Mehaffy et al., 1981). Klassen and Rawitsch (1981) point out that microcomputer-based social studies simulation/games can provide the laboratory experiences that the social studies has usually lacked. Cohen and Bradley (1977) used a simulation/game as the third cognitive task, problem solving, in Taba's instructional strategy. The incorporation of such perspectives into software and the reviews analyzing software may help establish the educational relevance of the activities themselves rather than the content and concepts included.

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YOU SHOULD
NOT HAVE
BOUGHT THIS
COMPUTER
AT ALL

COMPUTER ASSISTED LEARNING IN ECONOMICS, HISTORY, AND GEOGRAPHY CURRICULA IN ENGLAND, WALES, AND NORTHERN IRELAND

Ashley Kent
University of London
Institute of Education
United Kingdom

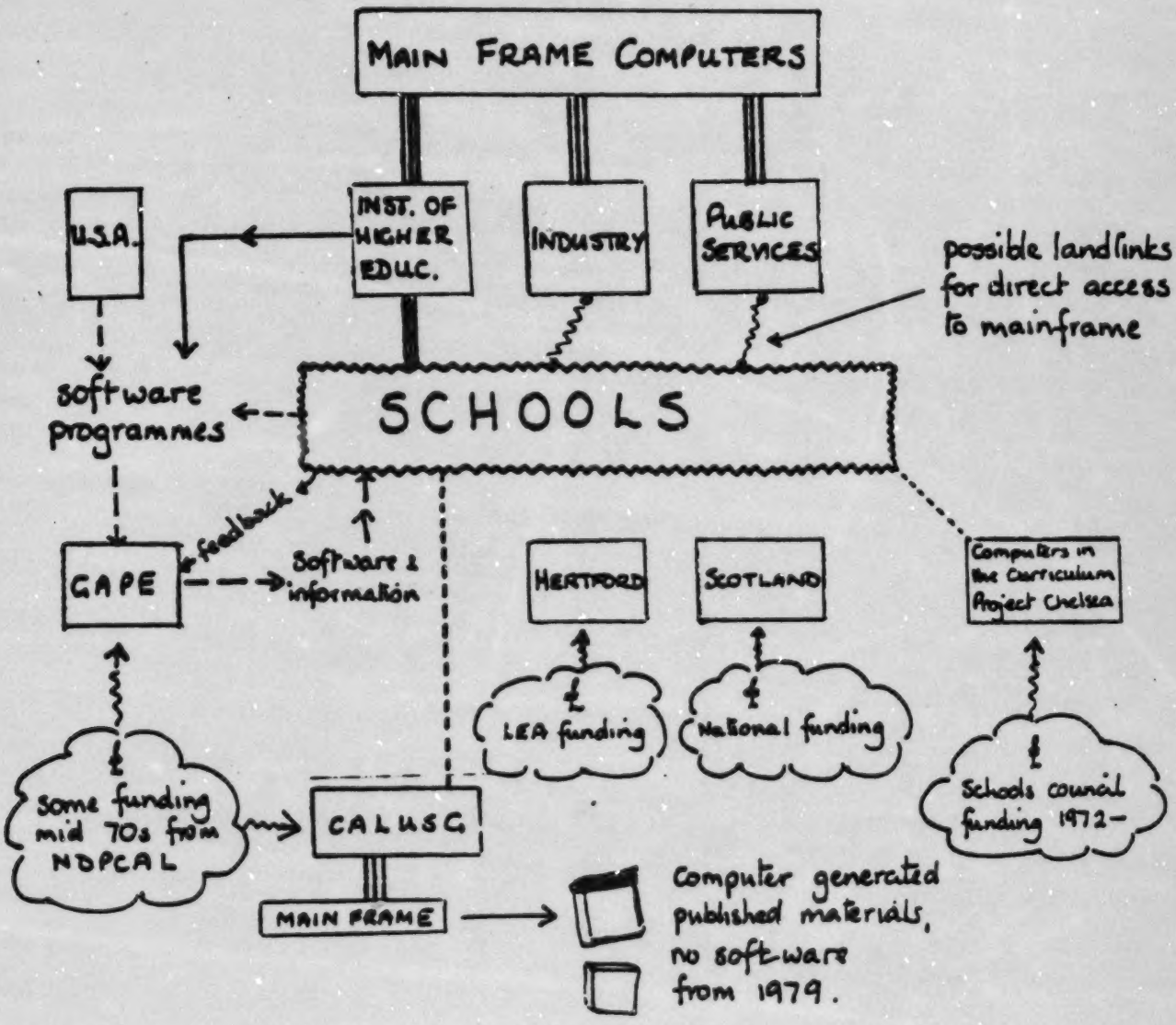
Government Initiatives

Computer Assisted Learning (CAL)[1] in England[2] in the 1970s could be regarded as being in the Paleotechnic era (Fig. 1). Here a few fortunate schools had links with mainframe computers usually housed in institutes of higher education such as polytechnics or colleges of education. Some disparate and isolated software ventures were under way but the majority of schools[3] and teachers were unaware of CAL.

Around 1979 the situation began to change rapidly. In England this could be called the dawning of the Neotechnic era of CAL (Fig. 2). First and foremost this happened because of the arrival of the microcomputer with all its advantages. The second influence was the decision of the government to encourage educational computing in schools. This was done in two ways. Firstly in 1980 the Microelectronics Education Programme (MEP) was launched[4]. This supported work under three headings: curriculum development, teacher training, and resource organization and support. The 1981-4 period of finance for MEP has recently been extended to 1986. Secondly, the Department of Industry in 1981 sponsored the 'Micros in Schools" scheme to help put micros in secondary schools in 1981-82, and the plan was extended to primary schools for 1982-83.

Relative to the business world the sums of money involved in these two initiatives have been trivial, but in the impecunious world of education in the nineteen eighties, these were riches indeed. The intended pump priming or catalytic role of such policies has been remarkably successful, and there is no doubting the momentum these two schemes have generated.

Fig. I The Paleotechnic Era of Computer Assisted Learning: 1970 - 1979



G.A.P.E. Geographical Association Package Exchange.
N.D.P.C.A.L. National Development Programme in Computer Assisted Learning.
CALU.S.G. Computer Assisted Learning in Upper School Geography.
L.E.A. Local Education Authority.

The 'Micros in Schools' Scheme has meant that by the end of 1983 every secondary school in England had at least one micro. They had an RML 380Z or a BBC 'B' micro each with high resolution graphics, minimum 32K RAM and printer. The speed of acquisition has been staggering. The government inspired momentum has been added to by parents, governors, the media, and the business world who together impose massive pressures on head teachers to purchase micros.

The author's own institution is a good example of the pace of change. In 1982 the University of London Institute of Education possessed seven microcomputers. In 1983 there were 35 and this pace of hardware acquisition is not unusual in the domestic market either. A recent straw poll of a class of girls in a London comprehensive school showed that 15 out of 25 girls had micros at home. The overall position in England now and for probably two years or so will be that the dominant micros in secondary schools will be BBC and 380Z micros.

The MEP Scheme has set up 14 regional information centres where vital in-service training courses are run. A key role of the Scheme has been to encourage and indeed financially support various agencies to engage in software development. These include publishers such as Longman[5], curriculum development projects such as that based at Chelsea College[6], and organizations such as GAPE[7]. Software publishing has indeed taken off and is now less the cottage industry it was a year ago. Sadly, however, most software is still under development and not yet published.

Although the recent development activity is very great and diverse, the author has categorized types of CAL as follows:

Categories of CAL in History, Geography and Economics

1. Information Handling
2. Statistical Analysis
3. Simulations
   a) Models and Systems
   b) Decision Making Exercises and Games
4. Reinforcement of knowledge, skills, ideas

5. Other uses of CAL
   a) Teaching Materials produced
   b) Electronic Blackboard
   c) Managing Resources
   d) Video/Micro Link
   e) Management of Learning

Some Programs as Examples of The Categories of CAL

Category	Program Name and source	Subject Area	Topic
1	QUERY (AUCBE)	H,G,E	Interrogates data sets
1	LEEP (BLEA)	H,G,E	Interrogates data sets
1	SOM 51 (SLEA)	H	1851 Census data for 11 parishes
1	SCAN (ILEA)	H,G,E	Interrogates data sets
2	GSTATS (L)	H,G,E	Elementary descriptive statistics
2	DESCRIBE (NC)	H,G,E	Various statistical measures
2	SPATIAL (NC)	G	Calculates spatial statistics
3a	RUNNING THE BRITISH ECONOMY (L)	E	Effect of monetary and fiscal policies
3a	MAXPRO (L)	E	Theory of the firm
3a	DROPLET (GAPE)	G	Model of the hydrological cycle
3a	GRAVITY (L)	G	Predicting journey patterns
3a	WELF (L)	G	Social indices of deprivation
3b	PARAFFIN FILE (BP)	E	Case study of UK paraffin market
3b	RAIL (L)	H,G,E	Rival railway companies plan networks
3b	CHOICE (L)	H	Disraeli and Eastern question 1875-8
3b	JUTLAND (E)	H	Battle of Jutland
3b	FARM (L)	G,E	Making profits given weather variations
3b	ROUTE (L)	G	Motorway route planning
4	SLOPES (GAPE)	G	Slope angles estimation and forms of transport
4	WEATHER (H)	G	Forecasting of weather
4	CONTOUR (CICP)	G	Contour map interpretation
4	CLIMATE (H)	G	Recognition of climatic types

Abbreviations for Sources of Programs

AUCBE	Advisory Unit for Computer Based Education; Hatfield, Herts. AL10 8AU.
BLEA	Bedfordshire Local Education Authority
SLEA	Suffolk Local Education Authority
ILEA	Inner London Education Authority
L	Longman Micro Software
NC	Newman College, Bartley Green, Birmingham, B32 3NT.
GAPE	Geographical Association Package Evaluation, Department of Geography, University of Loughborough.
BP	British Petroleum Education Unit, PO Box 5, Wetherby, West Yorkshire, LS23 7EH.
H	Heinemann Computers in Education Limited, 22 Bedford Square, London, WC1B 3HH.
CICP	Computers in the Curriculum Project, Chelsea College.

Abbreviations for Subject Areas

H	History
G	Geography
E	Economics and Business Studies

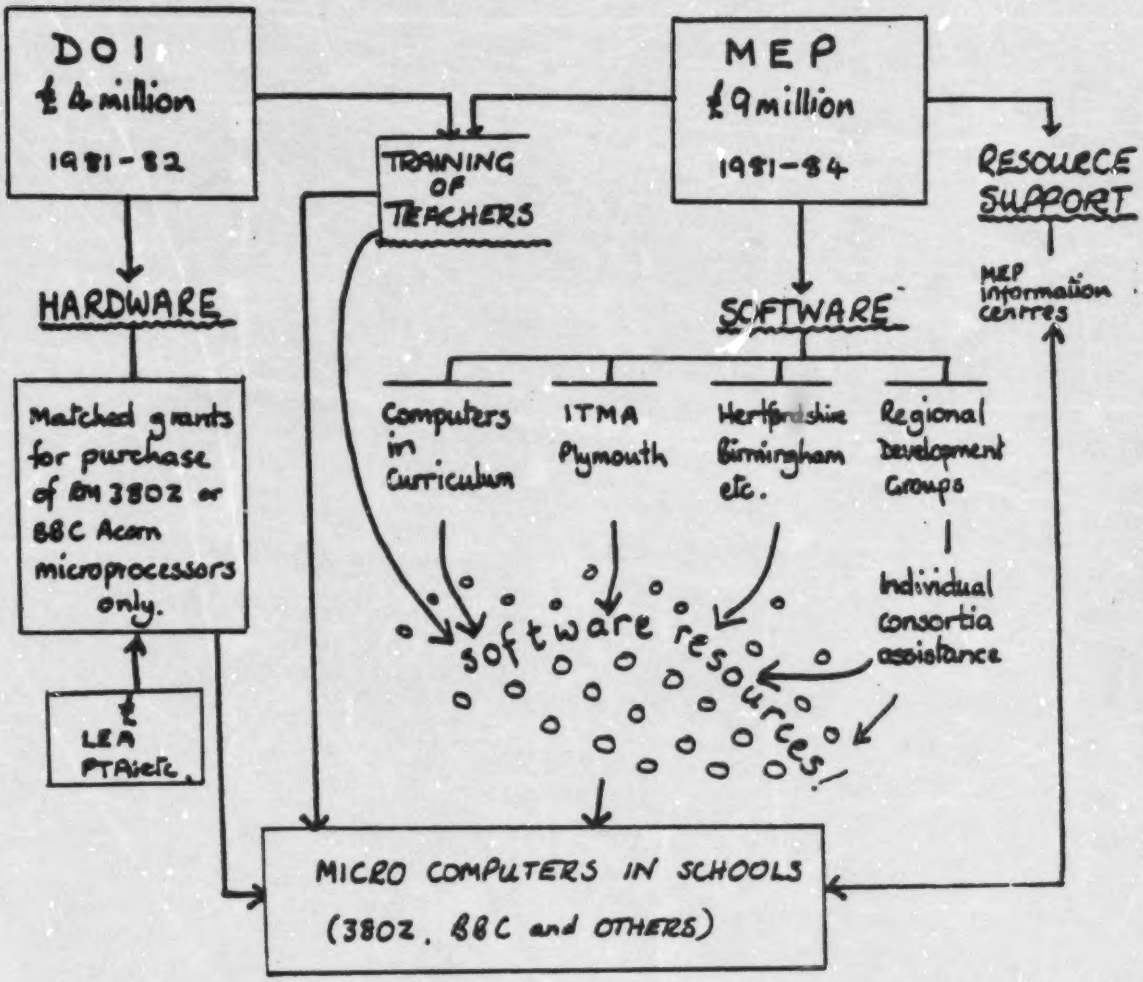
In summary the neotechnic era of CAL (Fig. 2) has witnessed greater coordination and pace of development in hardware acquisition, training of teachers, software development, and resource support.

CAL and The Three Social Studies Subjects

Here the author intends to give a brief picture of the involvement of geography, history, and economics with CAL. The position with geography is best summarized in Shepherd et al (1980) and more recently in Kent (1983). Of the three subjects, geography developed CAL interests earlier and has sustained such developments on a wider front than the other two subject areas. The recent Geographical Association Bibliographic Notes (1983) indicate the richness of software now available for school use.

Clearly the interactive, graphics facilities of CAL does suit modern school geography but much credit must go to the early work of GAPE[7] (David Walker) and Chelsea College[6] (Deryn Watson). Also, recent school geography has engaged in quantification, model building and simulations, all of which offer potentials for CAL.

Fig 2. The Neotechnic Era of Computer Assisted Learning: 1979-1984



D.O.I. Department of Industry.
M.E.P. Microelectronics Education Programme.
I.T.M.A. Investigation on Teaching with Microcomputers as an Aid.
L.E.A. Local Education Authority
P.T.A. Parent-Teacher Association.

As with other subjects many programs are promised but not yet published, and in the near future Longman alone is to publish 13 geography packs containing 19 programs in all.[5] However, as yet this software activity is not matched by classroom practice (Hall et al 1982).

History, on the other hand, has been slow to take on this particular innovation. Two publications, one from the Historical Association (1979) and the other an issue of Teaching History (1982) best summarize the present position. The greatest enthusiasm has been shown for information handling programs which reflect the 'New History'. This recent trend encourages pupils to consider historical methods and events through the examination of source materials and evidence. Allied to this is a move towards more recent economic and social history for which much data is available to be examined and quantified. Such work has been spearheaded by Peter Laslett at the Cambridge Centre for Population Studies and involves study of census returns, parish registers, wills, inventories, and records and so on. This data needs searching, quantifying and aggregating, and information handling CAL packages are seen to have great potential here.[8]

Many history teachers regard CAL as no more than a gimmick and passing fad and are particularly scathing about CAL simulations. They see the danger of oversimplification to the point of distortion. They argue that such simulation suggests that certain events were inevitable (Blow, 1982) and make the dangerous assumption that decisions were logically made. Developments in artificial intelligence, and in particular Prolog[10] are described by Ennals (Forthcoming) and are either regarded as a pedogogical cul-de-sac or as one Inspector put it, "I take a sceptical but undismissive attitude." Many teachers share the view of Derek Turner (1982) who suggested that, "The long term importance of the computer in the history classroom is uncertain. It cannot become clear until more software programs are available and more schools have tried and shared their experience with others."

Cotterell (1983) reviews the state of economics and CAL and this is the most useful source until Randall's book (forthcoming)

is finally published. Again much software is promised yet little has yet been produced. Running the British Economy[11] and the early Schools Council Programs[12] have enjoyed reasonable success in schools. Most programs seem to play a reinforcement role with respect to skills and/or knowledge. Some economics teachers are making a strong case for using computers to present simulations which make otherwise complex and seemingly abstract models reveal their important practical applications at a relatively early stage in an introductory course. Most software is for the 16-19 age group and as yet only few economics teachers are making a strong case for using computers to present simulations which make otherwise complex and seemingly abstract models reveal their important practical applications at a relatively early stage in an introductory course. Most software is for the 16-19 age group and as yet only few economics teachers have ventured into CAL.

To summarize across the three subject areas, one can say that most teachers have decided against using CAL (Fig. 3) since although attitudes in general are positive there is not enough hardware or software available; teachers' awareness, knowledge and therefore confidence is limited; and no obvious green lights have come through from educational research. Most programs in use are from the mainframe (paleotechnic) generation and therefore are less sophisticated (e.g. graphics) than those which are currently being published.

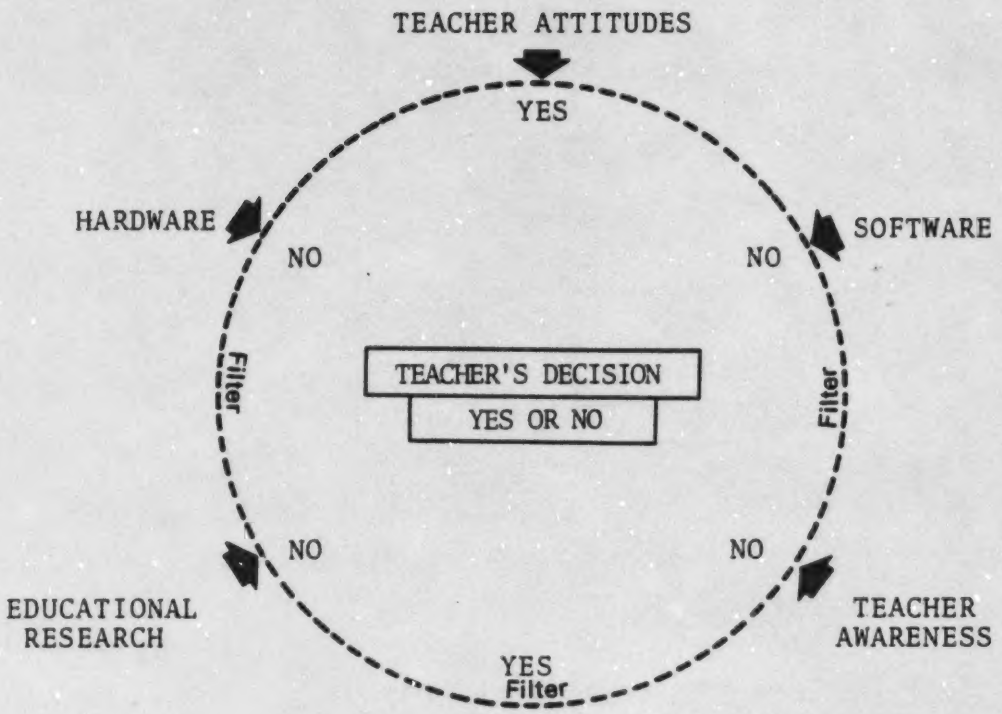
Messages from Research

Sadly educational research[13] into CAL has been far outstripped by software and hardware developments. This has meant that as Deryn Watson[14] observed in April 1983, 'nearly every program that is developed is published' and could perhaps explain an Inner London Education Authority computing inspector's remark that "80 per cent of programs are garbage." The pressure on developers is to develop, not to carefully evaluate CAL developments as to their learning and attitudinal implications. Quality control leaves much to be desired, and advocates of CAL are in danger of alienating a good number of favourably inclined teachers.

Not only are classroom teachers hungry for evaluative information on CAL but key decision takers in government need such data

Figure 3

COMPUTER ASSISTED LEARNING: TO USE OR NOT?



(The influences on a history, geography or economics teacher in 1983)

equally urgently. In England for instance the new government will need such data to enable a decision about extending MEP beyond 1986.

Some research has been conducted, but most is ongoing. Examples are listed in the notes of this paper of research into CAL geography[15] most of which is yet to be completed. Some important messages are coming through to teachers and software developers. Four examples are selected here; Three from research into the classroom. Robinson's research (1982) suggests that less able pupils may have negative attitudes to CAL prior to such a lesson, yet, after their experience their negative attitudes may harden still further. This corresponds with Wood's findings (1983) that 'able, confident students may dominate while less able members of the group may opt out of the learning process and find it easy to do so'. Another message comes from Hassell's research (1982) in which he found noticeable learning gains and greater involvement by pupils taught by more student-centred styles of CAL teaching. The third message comes from Hall et al (ongoing) whose work in classrooms suggests that teachers start off by using the 'gatekeeper' approach (as an electronic blackboard), and as experience and confidence is gained that they move to the 'partnership model'.

Finally, the work of Kent (ongoing) points to massive inertia in the educational system in response to the CAL innovation. The 1982 and 1983 questionnaires to all humanities and geography advisors pointed to considerable ignorance, lack of awareness and involvement in CAL. This from key facilitators for curriculum change! As Atherton (1980) put it ".... the effort required is small and the benefits seem obvious.....but the small effort needed to set up the computer and perhaps a TV screen may be too high a price for many teachers."

Crystal Ball Gazing

Inevitable dangers enshrine prediction in such a volatile part of the educational world! However some concluding comments will be made by the author.

Firstly, the success of in-service and initial training, will be critical to the success of CAL. As Esterson (1983) suggested, 'If we don't have adequately trained teachers and a sensible appreciation of

the potential of the equipment, it could just become a toy for playing space invaders on a wet Friday afternoon'. Secondly coordination of software and hardware developments will be vital since undoubtedly history, geography and economics teachers find CAL developments confusing. In England the regions of the MEP in theory should play a vital role in coordinating software, information, and training for teachers. It remains to be seen how successful they will be.

Finally it is hoped that practitioners in economics, history and geography education get together to decide on future software priorities. Happily in England the MEP/DES has already done this for geography in England and the suggested directions include: graphical and diagrammatic data base programs; greater use of graphics tablets and the potential of Landsat; further work on programs developing mapwork skills and linked with the Logo Turtle; integration of micro with videodisc; and further consideration of programs for fieldwork. It is to be hoped decision makers take note of these suggestions and equally as important organize similar conferences for history and economics teaching.

Notes

1. Subsumed by this umbrella term are for example: CAI - Computer assisted instruction, CAT - Computer assisted training, CML - Computer managed learning, CMI - Computer managed instruction, and CBL - Computer based learning.

2. England, Wales, and Northern Ireland will be referred to as "England" in the paper.

3. This paper focuses on secondary schools, i.e., for ages 11-18.

4. Microelectronics Education Programme. The Strategy. Department of Education and Science. April 1981.

5. Longman Micro Software

6. Computers in the Curriculum Project based at Chelsea College, University of London.

Notes contd...

7. GAPE is partly an organization for developing geography software and is based at the Department of Geography, Loughborough University. Since 1981 several programs have been developed with MEP support.

8. For example, Micro QUERY developed by the Advisory Unit for Computer Based Education at Hatfield and SO M 51 developed by Beverley Labbett for 11 Suffolk parishes.

9. For instance the RAISING OF THE MARY ROSE developed jointly by the Mary Rose Trust and the BBC and CAMPAIGN, the progress of the English army before Crecy and developed by Chelsea College.

10. The Logic Programming group of the Department of Computing at Imperial College, London have been investigating the teaching of logic as a computer language (PROLOG) for children.

11. RUNNING THE BRITISH ECONOMY developed at Herriott Watt University is now published by Longman and is the basis for an annually held schools competition.

12. Published in 1978 first by Arnold now by Longman, this package consists of 10 programs including those on elasticity of demand, the national income multiplier, fiscal policy, credit creation and monetary policy.

13. Here the author takes Mouly's definition of research as 'Best conceived as the process of arriving at dependable solutions to problems through the planned and systematic collection, analysis and interpretation of data. It is a most important tool for advancing knowledge, for promoting progress and for enabling man to relate more effectively to his environment, to accomplish his purposes and to resolve his conflict.'
Mouly, G.J. (1978) Educational Research: the Art and Science of Investigation, Allyn & Bacon, Boston.

14. International Geographical Union conference on CAL in Geography held at the University of London Institute of Education, April 10-13, 1983.

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Kent, W.A. (ongoing) 'CAL and Secondary School geography, 1982-85. A study of the process of curriculum change'.

Kent, W.A. (ongoing) 'The effectiveness of the MEP at the local level'.

Midgley, H. (ongoing) 'Evaluation of GAPE software'.

Ramsay, A.P. (ongoing) 'The evaluation and development of certain CAL geography units'.

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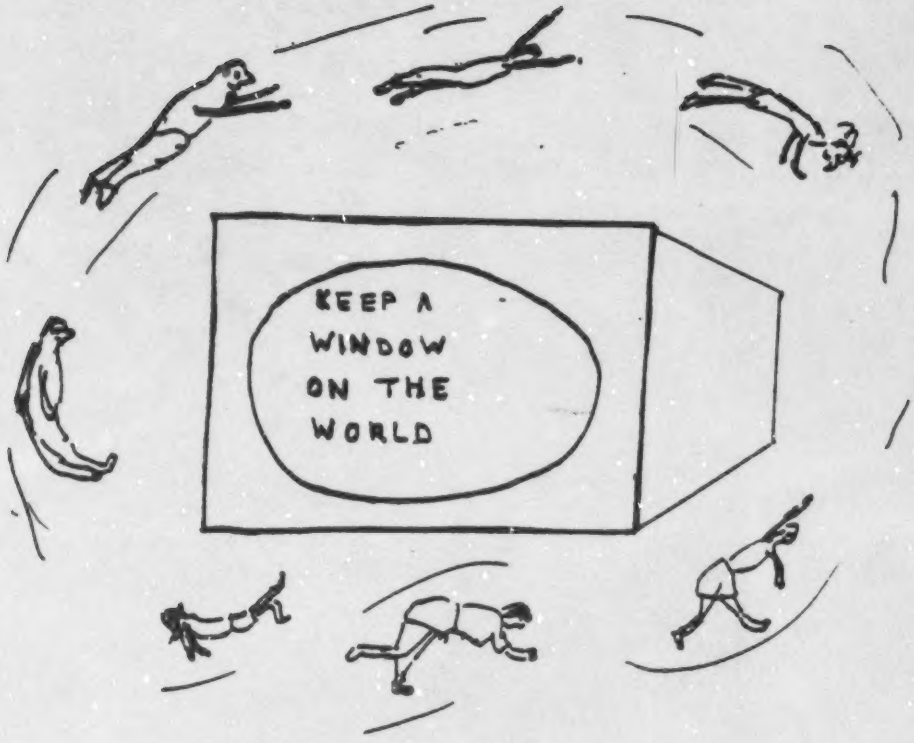

TV- satellite

Wimpy

EXPERIENCES WITH VIDEOTEX AND EXPECTED EFFECTS OF CABLE TV ON EDUCATION IN WEST GERMANY

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In the Federal Republic of Germany since 1976 there has been extensive public discussion on the so-called "new media." Interest has been prompted by a report of a government commission of the extension of the telecommunication system in the Federal Republic of Germany by the year 2000.

Meanwhile several of the systems proposed in this telecommunication report (BROADCAST VIDEOTEX, INTERACTIVE VIDEOTEX) are about to be realized. Other are about to be tested (CABLE TV). Altogether the development in the field of telecommunications has been much slower in the last five years than had been predicted, mainly for political reasons.

The main emphasis in the discussion on the introduction of new telecommunication technologies is on political and economic factors. Social and educational aspects have not received as much attention. People discuss the expected economic impetus of investments of about 100 billion Deutsch Marks and about creating new jobs through telecommunications, but at the same they do not pay as much attention to the potential educational and social impact of the "new media."

The term "new media" is used to refer to videodisc players, broadcast videotex, interactive videotex, satellite television, cable television, interactive cable television and integrated telecommunication systems in glass fiber optics technology. I will concentrate my remarks in this paper on videotex and cable television.

Videotex

In Videotex there are two technical systems, which are often confused: Broadcast Videotex and Interactive Videotex. Each will

be considered.

Broadcast Videotex (BV) - German "Videotext."

BV consists of the wireless transmission of text in the so-called scanning gap of broadcast TV picture, i.e., BV is broadcast from a radio station together with the television programme. In order to receive BV on your home television screen, your television set has to have a decoder. The text pages are continually broadcast by the radio station. The recipient can choose the desired text page by typing the appropriate page number on the remote control and can hold the page on the screen as long as needed to read it. The selection time or waiting time depends on the total number of broadcast pages, e.g., with a total number of one hundred pages broadcast it takes up to twelve seconds. Besides text, simple graphs can be broadcast also. The text can be overlapped on the running TV programme (e.g. subtitles for movies), or it can be watched separately on the screen.

BV has been tested since 1980 in a national field experiment. Each person who has a TV with a decoder can receive BV free of charge. Presently 250,000 sets are installed. The BV Central Station is in Berlin. Presently approximately 200 text pages are offered each day.

The BV programme consists mainly of the news, weather report, sports, lottery results, consumer tips, TV programme guide, and subtitling from TV movies and sport events for those with hearing handicaps.

Unfortunately, BV is hardly being used for educational purposes. Exceptions are the listings of educational-relevant TV programmes and cultural events which are available on BV. However, BV could also be used to provide supplementary information and for special school TV programmes. For example, foreign words and special terms could be explained in a series, so that the programmes could be used in more than one grade.

BV has as a special feature the technique of the covered response. In this technique the answer to a question does not appear on the screen until the response key on the remote control

has been pressed. This technique can be used for programmed learning, for study quizzes, and for self-controlled tests. The student can try his own answer and afterwards compare this with the uncovered answer. Obviously, this BV technique is more advantageous for learning at home, where each student has his own TV set. It is less useful for learning in a group, because each student has to react individually. Also, the writing on the screen is too small to be read at a distance as would be necessary in a classroom.

The subtitling capacity has many advantages for teaching students with hearing defects. It is also useful for foreign language instruction.

As far as we can see today BV has no negative impact on social or cultural life.

Interactive Videotex (IV) - German "Bildschirmtext"

IV combines the home television set with the telephone network. To receive IV one needs a telephone line, a modem for the connection between the phone and the television set, a TV set with a decoder, and a remote controller (or even better an alphanumerical key board). A printer would probably be a luxury.

The text information is stored by the information providers in the central computer of the Federal Post or in private external computers connected to the system. The IV recipient has direct access to this information through his telephone line. The amount of information on each text page is the same as in Broadcast Videotex, that is, 24 lines each with 40 characters.

IV was developed in Great Britain and has been introduced in approximately 20 countries under various names (VIEWDATA, PRESTEL, ANTIOPE, TELIDON, BILDSCHIRMTEXT). In the Federal Republic there has been an IV field project in Berlin and Düsseldorf from 1980 to 1983. More than 5000 households have participated in these research projects. In 1984 IV will be introduced nationwide. Then each person can become an IV user and theoretically also an IV information provider, providing the technical equipment is purchased and the set fees are paid.

Presently there are approximately 2000 IV information providers,

and over 300,000 pages are currently offered in IV. The information is structured hierarchically and listed in menu form. The user can get to the stored information in four ways: 1) through the systematical table of contents, 2) through the alphabetical index of information providers, 3) through the alphabetical subject index, 4) through the direct choice of page numbers. The systematical table of contents has nine categories; Education can be found under Category 7. There are very many pages for the categories of ECONOMY, MONEY TRANSFER, and OFFERS OF GOODS AND SERVICES. On the other hand in the areas of KNOWLEDGE, EDUCATION, and CULTURE there are only about 15,000 pages from approximately 150 information providers.

These information providers are mainly institutions of higher learning or institutions of vocational training and continuing education as well as churches, commercial correspondence schools and publishing companies. One can expect that in the coming years many more education institutions will become IV providers and that the total information offered for education will increase rapidly.

Educational Uses

Which education related contents and services can be offered through IV? The potential is considerable:

- Information on external educational programmes
  (Addresses, office hours, dates, fees, regulations)
- Registration and ordering
  (Course registration and confirmation, ordering of books and learning material)
- Lexical information
- Reports and Reviews
  (Introductions, summaries, literature reviews)
- Courses
  (Adjunct courses, refresher courses, correspondence courses, programmed learning)
- Information exchange (textual)
  (with teachers, with other learners)
- Computer services accessing external computers
  (Computer assisted learning, information search, computer aided problem solving, computer simulation, tests)

In addition there is also the IV personal correspondence service which is an electronic mail service. With this each IV participant can send personal news to another IV user. Educators could use this technique for ordering forms, books, and audiovisual media, or it could be used by students for questions to the teacher and for an information exchange between the individual learners.

It should be noted that IV information pages can be coded so that only a certain group has access to this information in the Central Computer. This is particularly useful for a fast information distribution or for continuing education in certain vocations (e.g. physicians).

IV can be used versatilely if the information provider accesses an external computer. The first education institute to use the external computer is the Open University at Hagen. Their students have direct access via IV to the university's computer. In this way the students of the correspondence courses can reach a large data bank from their homes making the following services available: 1) computer aided information, 2) registering for courses with immediate confirmation, 3) ordering books and learning material, 4) computer aided learning, 5) tests, 6) problem solving, and 7) simulation experiments.

If the IV user owns a personal computer at home, then he can quickly transfer computer programmes through IV and work them out later on, therefore keeping down the online-time for the university's computer and for the IV net.

Impact of IV on Family, Home and Society

What were the results of the field experiments with IV? Although the field experiments were not carried out with a representative sample of the total population one can draw some conclusions. At the beginning of the experiments in 1980, IV was used by half of the recipients at least once a day for half an hour. In 1983, at the end of the experiments, they used IV only three times a week for half an hour each time; that makes an average using time of only one and a half hour per week. One third of the children in IV households did not use IV at all. The other two thirds used it mainly for entertainment.

In a comparison of the use of the IV information categories offered, the category "News" was in top place, the category "Knowledge/Education/Culture" was only in eleventh place.

When IV users were asked which attributes they liked best in IV, the following responses were received:

The information is available at any time of the day.	8%
One has quick and easy access to the information.	31%
The system is interactive (one can give orders, send information, and can make a computer dialog).	61%
	100%

Of possible interactive IV services tele-banking and tele-shopping from the living-room were particularly liked.

What impacts will IV have on the personal realm and on family life? IV is normally used alone without a partner. It is used mainly instead of watching television. Still IV users believe that due to using IV they communicate about 5% less time with their family than before. And, if the family had only one TV-Set or only one telephone line, quarrels developed in the family about IV use. The users believe that IV leads to being better informed on cultural and political events, and that it particularly saves time through tele-shopping, tele-banking, and tele-visits to official offices. That raises the question as to whether personal contacts are being reduced. IV users don't believe this. They believe that through IV one can actually make new personal contacts, (e.g., there are ads in IV for making new acquaintances).

Today only 23% of the German population is interested in IV. The highest interest is in the business sector. Also ranking high in interest are individuals with a higher education and with technical interests who are between 30 and 40 years old; and this is true in men in these groups much more than women.

The main argument <u>against</u> IV is the danger of misuse of the private user data. As in order to bill the users and to pay the information providers the user behaviour of each IV-participant

is stored in the Federal Post computer. A misuse of these data cannot be excluded from concern.

Impact of IV on Education

On the use of education related-IV we have made an intensive investigation with 40 IV users in Berlin. In this investigation we found that there is a strong interest in up-to-date educational news, for lexical information, for services like registering for courses and ordering of literature, for individual information on problems, as well as for short interactive courses. The interviewees felt that in IV there is a lack of personal contact with the teacher and with other students. But they felt that this could be coped with through occasional personal contact.

The reading of IV text pages takes about one third more time than reading a page in a book, and it is more exhausting. Therefore IV will not be able to replace the book even if the optical quality is improved. Nevertheless, a high acceptance of IV can be expected, particularly in the field of private continuing education and in vocational training. The users apparently are more willing to pay fees for educational programmes than for entertainment offers. In the institutions of higher learning IV will become more important as a medium for distributing up-to-date information and as an access medium to a central computer.

In contrast there is likely to be less use in the schools because IV is an individual medium and not very effective for group learning. Therefore, in school IV will mainly play a supplementary role as a source of reference, as an individual learning aid, and as a tool for remedial learning.

The indirect impact of IV on the school will be much stronger. The information behaviour and the learning motivation of the students in general will be changed fundamentally because of increased use of IV in the private realm. Since fundamental knowledge of any kind can be recalled electronically at any time, the motivation for memorizing knowledge will decrease strongly, while search strategies, the ordering of information, and competence in using computers as a working tool will become more important.

Cable Television

In the Federal Republic of Germany radio and television belong to public radio stations. They broadcast two nationwide and five regional TV channels. Up to now there are no private radio and TV stations in the Federal Republic, mainly because of a shortage of frequencies. (Visitors from the USA generally judge the quality of the programmes positively.) About 40% of all households are connected to smaller coaxial cable systems in residential districts and they can receive additional television stations from neighbouring countries.

Adults watch TV at an average of approximately 2 hours per day, adolescents from 8 to 13 years watch about one and a quarter hours, and children from 3 to 7 years watch about 45 minutes. During the last few years the television consumption has decreased a few minutes on the average. On the weekends the viewing of television is relatively higher than on the weekdays. The main viewing group consists of elderly people over 50 years old. For all age groups one can generalize that the less the school education, the higher the television consumption.

In the recent few years there has been continuing discussion on the introduction of cable television in the Federal Rebulic, mainly because this new technology would allow commercial radio and commercial television. Cable television is demanded by representatives of the industry, and this demand is supported by the present government, which expects that cable television will produce a greater variety of opinions.

In this discussion it is necessary to distinguish between one-way cable TV and two-way cable TV. With one-way cable TV one can distribute a larger number of TV and radio programmes in good technical quality via cable TV networks (without a feedback channel). One coaxial cable can carry about 30 television channels. Therefore two cables provide about 60 channels.

With this type of cable TV group-oriented and special programmes would be possible. If financing is provided, special channels could be made available for education with programmes for schools or for autonomous learning.

With two-way cable television including a feedback channel, completely new forms of telecommunication become possible. Through the feedback channel users can send information back to the service center. For example, they can type in multiple-choice-answers, recall programmes, and even send moving pictures like picture phone through the service center to other users. (In this latter case, however, the feedback channel must be a broadband channel.)

One can imagine a many-sided use of a two-way cable TV system in the field of education. The services are similar to those of Interactive Videotex. However, in addition, sound, still or moving pictures can be conveyed with two-way cable TV. For example, correspondence courses with sound and picture interactions can provide two-way communication. The teacher or the private learner at home will be able at any time to call up educational films or audiovisual learning programmes from the service center.

In the Federal Republic of Germany 4 pilot projects are being planned for testing the possible uses of cable TV. In these field tests the technical possibilities, the actual use by the customers as well as the economical and social consequences are to be investigated.

Cable projects in Munich and Ludwigshafen are to start at Christmas in 1983, at first only as one-way systems. Later on a feedback channel will be added. In projects in Dortmund and Berlin the feedback channel is planned to be used from the beginning for interactive services, but planning has not been completed as yet.

The Impact of Cable TV

Representatives of the field of education in the Federal Republic are generally sceptical about the introduction of cable television. On the one hand, they see the possible benefits of this system, but at the same time they fear rather negative effects on society, especially on children. They fear that cable television may lead to an enormous influx of entertainment programmes; especially children and young people would hardly be able to resist this temptation, and as a result they would spend more time inertly watching television.

The increase of programmes is predicted to lead to societal disintegration. Each person will have access to different infor-

mation sources, and as a result there will be less common ground for conversation. Instead specialization will increase.

Through the introduction of commercial television it is feared that the quality of the programmes will be lowered, because only relatively mediocre programmes will appeal to large numbers of viewers. Programmes of high quality and information services will mainly be sought by people with a higher educational background. The effect will be that the gap between the educated and the uneducated, or between those rich in information and those poor in information will become larger instead of smaller.

Generally, the means by which we receive information with the future technology will influence the structure of our thinking. In the long run the use of computer language and the increase of visual learning will have major effects on thought and communications and thus on the whole society.

New Media and Consequences for Education

In spring 1983 at the Free University of Berlin we investigated the opinions of 30 students of education, psychology, and journalism on the new media. It was revealed that the majority of them received their information on new technologies mainly through newspapers and partly through television and radio stations and less through their friends. For these students the new media are not a serious issue as yet.

Of the students questionned 60% had a definitely negative attitude towards the new media. They grounded their rejection mainly on the four following apprehensions:

1. They fear an increase of political and economical influence on the individual through the new media partly because they believe that the new media lead to greater monopoly in the media field by powerful companies.
2. They fear a decrease of direct social communication through tele-shopping, tele-banking, etc., and through this, an increase of anonymity in society.
3. They fear that the new media will lead to a further rationalization and mechanization in many professions, thus causing many jobs to be lost. The number of new jobs created by the new media will be few in comparison.

4. They fear that automatic recording and analysis of media consumption behaviour could lead to an increase in the control over private life.

In this investigation it became evident that the negative attitudes towards the new media correlate highly with the general apprehension regarding technological advancement. The dangers attributed to the new media are considered just as great as the dangers through atomic weapons and environmental pollution.

Students, as a minority, consider the only possibility left for them to stop the development of new media is by protesting or by quiet resignation. As they see it, the majority of the people will agree to be led into the promised media land through a tempting increase of additional entertainment.

How should education as profession react towards the introduction of new communication technologies? Should one try to stop it or at least to delay it? I doubt that educationists are influential enough to stop the development of these technologies. It appears to me that a forward or positive strategy is much more promising: The advantages of the new media should be used as far as possible for the goals of education. This will be possible only if educationists engage themselves in the formulation of regulations for the new media and in the planning of public projects, rather than leave this field to industry and politics.

The second task is to intensify media education in the curricula. Current media research indicates that the education of people is the main defining factor of their future media behaviour. Therefore, teachers, parents, and finally, the children must learn to handle the telecommunication media as tools, which then can be exploited for their personal needs and interests as well as for public improvement. Active media education will be one of the main tasks for the home and the school for the coming decades. The best goals will be reached only if teachers and parents themselves show a positive modelling behaviour.

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"Dammit. I never get a program about an alternative way of life."

MICROCOMPUTERS IN THE SOCIAL STUDIES

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Once upon a time there was a society. This society transmitted information only by word of mouth. Then one day some enterprising people in the society invented two new ways to transmit information. They called these reading and writing. Some, but not many, people in the society were excited about reading and writing. These were people in government and business who bought the new technology. The sellers of this new technology wanted to expand their markets. So they turned to the schools. The marketers designed a system where professional writers wrote down the words of the teachers. Then trained readers read the writings of the teacher's words to the students. This new system was very cost effective, because it required less time of the teachers.

Soon the teachers began to think, "Why can't we understand this new reading and writing technology?" So the teachers began to teach themselves to read and write. Their reasoning was that reading and writing seemed to be fundamental skills. If reading and writing were fundamental, why not teach students these fundamentals. Just to use reading and writing (W.A.I. - writing assisted instruction and R.A.I. - reading assisted instruction) to transmit information to students was cheating the students out of the opportunity to actually read and write. Happily, the new skills of reading and writing became more accepted in the society. Some school administrators and college professors thought the skills might be useful and began to use them. After a number of years, all the schools in the society had as major goals the teaching of reading and writing.

A Parable for Today?

Can we characterize our current society along the same lines as the above parable? Much of the information in our society is trans-

mitted by means of the written (and read) word and has been for about 400 years. Several decades ago we gained the medium of television where information is converted to the spoken word and to visual images. Now we are being told we are in the age of computers. Some have called it "the age of information." The teachers in our society are asking: "Is computer literacy as fundamental as reading and writing?" "Are we cheating students if we use computers just to transmit information to them?" "What are the benefits of the new microcomputers?"

In this paper we present some beginning ideas that will help social studies educators establish at least a speaking acquaintance with some developments in the field of microcomputers and their classroom uses.

What is a Microcomputer?

Most urban and suburban school districts own or lease a computer for central office uses--mainly bookkeeping, records storage, school schedules, and other administrative tasks. In some districts these comparatively large "main-frame" computers are also used for instruction, in which case the programs (i.e., courses, units, or lessons) are stored in the central computer (or on easily accessible tapes or punch cards), and teachers and students use remote terminals (electronic keyboards) to gain access to these programs. The remote terminals are connected to the central computer by district-owned cables or by use of local telephone lines. Users of these computers share time on computer circuits in much the same way planes share airport runways for takeoffs and landings. The main-frame computer is designed to handle complex routines for many simultaneous uses at an optimal speed for each user. Smaller versions of main-frame computers are called minicomputers, but even these are too large and expensive (at present) for a single school's uses.

The microcomputer was developed in the mid-1970s to meet the needs of individual users who wanted exclusive, "dedicated" use of their own computers, at relatively reasonable costs. This self-contained computer is most appealing to owners of small businesses, to self-employed persons such as doctors, dentists, and writers, and to families and schools--and also, of course, to manufacturers of

arcade game machines. Figure 1 provides a diagram of the main components of a microcomputer system: (1) a plastic or metal console with a typewriter keyboard and containing a CPU (Central Processing Unit), ROM (Read Only Memory) chips which are permanent storage for one form of BASIC language, and RAM (Random Access Memory) chips for storing information fed in by the user; (2) a monitor, which is essentially a small television set, for displaying the computer's output; and (3) a disk drive, which accepts diskettes (i.e., "floppy disks," that look like thin, flexible 45 RPM records) that contain data or programs, making a diskette an external memory.

Figure 1

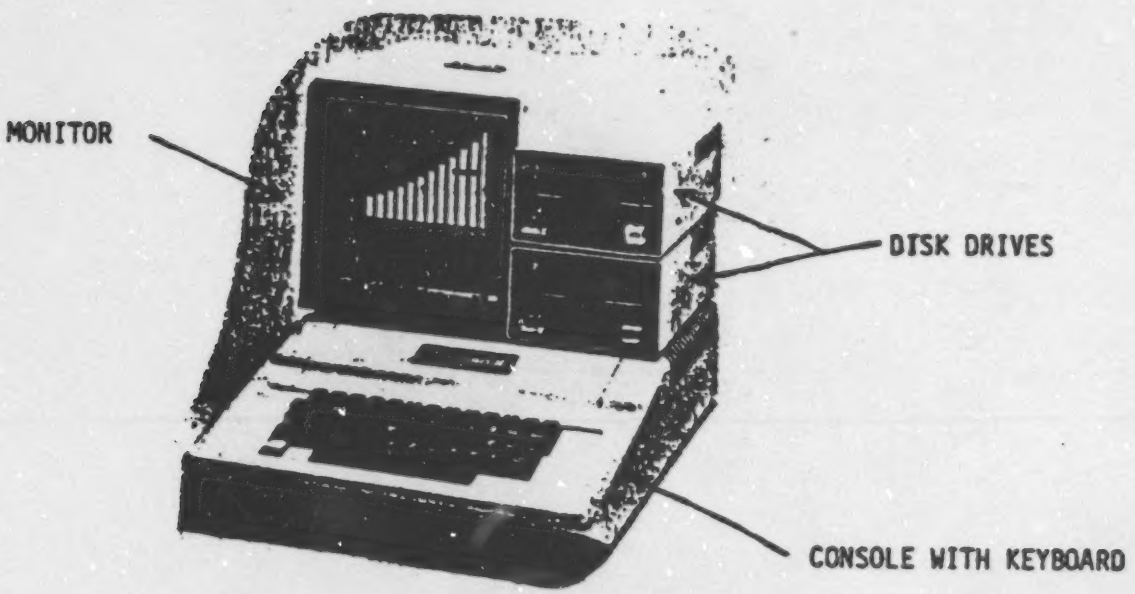


Photo: Apple Computer, Inc.

The proper greeting for a microcomputer is "HELLO," but one's initial contact is like meeting a person for the first time without anyone to make the introductions. Of course, there are manuals and tutorial booklets to prepare the novice user, yet these do little to

alleviate first fears. Practice and trial-and-error efforts soon reward the beginner who stays at it. The chief early rewards are mastery of the keyboard and some basic commands, the ability to use commercial or teacher-created programs on diskettes, and the skills needed to do rudimentary programming in BASIC language.

Microcomputers in the Classroom

The basic questions principals and teachers ask about microcomputers are: (1) What are their present and potential educational uses? (2) What types of programs ("software") are available, at what grade levels, and in what subjects? (3) Has there been any evaluation of the software? (4) What are the costs for the equipment and for commercial programs? (5) What are the classroom logistics and scheduling demands? and (6) What do teachers and students need to know about the microcomputer in order to use it effectively as a classroom learning tool?

A Few of the Answers. There are at least two categories of classroom use of microcomputers: management and record-keeping tasks and instruction. Many routine classroom chores can be completely handled by an in-class computer or can be simplified with the help of a computer. Teachers do considerable record-keeping that could become less burdensome with the aid of a microcomputer: maintaining class rosters; checking textbooks out to and back from individual students; recording and reporting student attendance; recording completion and grading of homework assignments; recording results of quizzes, tests, and examinations; analysis of scores in determining letter grades; creating and producing ditto masters; and other information processing required by district and school policies.

There are six general uses of microcomputers as aids to teaching and learning. These are: (1) Drill and Practice, (2) Tutorial, (3) Demonstration, (4) Simulation, (5) Instructional Games, and (6) Computer Literacy Skills (Note 1).

Drill and practice is the simplest, most mundane type of microcomputer use and also the easiest type of program to create (for professional program designers and for teachers who write their own software). For social studies, most programs fall in this category, focusing on such topics as: capitals of states, geographical loca-

tion of nations and continents, relational geography (e.g., Colorado is north of New Mexico and west of Kansas), capitals of nations, library research skills, and reading and summarizing tables of information presented in graphics.

Tutorials instruct the student in a sequence of *question*(computer)-*response*(student)-*feedback*(computer), in the well-known programmed instruction formats of linear or branching. Elementary social studies programs of this type are: how to read a map, how to handle money, how a bill becomes a law, colonies in the New World, and natural resources of _____(a nation). This use is clearly almost as limiting as drill and practice.

Demonstration is a traditional teaching technique most commonly used in teaching science and mathematics. Using the microcomputer for demonstrations assures that the demonstration will work as planned and that students--one or two at a time at the console--can see what is happening. Further, this use often incorporates many special capabilities of the microcomputer like high-resolution graphics, multicolored diagrams, sound effects, and moving figures. The computer is particularly well-suited to demonstrating such processes as planetary motion or fruitfly genetics, and it can also be used to demonstrate system interactions in the social sciences like the circular flow diagram of a market economy, the evolution of geological strata (as in Grand Canyon), the time flow of underlying and immediate causes of an historical event, the public transportation systems of a large urban complex, and the dynamics of a social system (e.g., a family or an elementary school). One elementary social studies program ("Historic Scroll") prints up to 40 separate time lines of key events from B.C. to the present. Another ("You Can Bank on It") demonstrates how a bank operates as an interactive system. Demonstration programs for social studies are relatively rare at present.

Non-computer simulations have been popular with social studies teachers for the past fifteen years. Now they are available for the microcomputer, but with one somewhat severe limitation. Since social interaction (i.e., student-to-student and small group) is a valued aspect of in-class social simulations, the machine-student interactions of microcomputer simulations tend to restrict if not preclude

interaction among students.

Simulations model real-life or fantasy situations in simplified forms. They allow students to understand the essential factors involved and to change or manipulate key variables to yield diverse outcomes. Unlike games, simulations do not result in winners or losers; they tend to emphasize the process, the interaction of variables, and the effects of human decisions. There are quite a few commercially produced simulations for social studies, simulating such contexts as: an overland journey on the Oregon Trail in the nineteenth century; the fur trade in the 1770s; ruling the ancient kingdom of Sumer; transporting furs by canoe from Minnesota to Ontario, Canada; small business practices in selling apples, bicycles, or lemonade; problems faced by forest fire dispatcher; and presidential election campaigns.

Instructional games usually simulate a situation in which the goal is to beat an opponent--another student or the computer. Here also there are many programs available for social studies, but as is the case with simulations, there is considerable variation in quality and appropriate applicability. Topics of some instructional games are: getting from point A to B by the shortest and quickest route (map reading skills); solving a murder mystery (logic and problem-solving); and war games (Napoleon/Wellington at Waterloo or North/South in Civil War).

Finally, teachers can use microcomputers to teach computer literacy skills. Becoming literate with computers generally means being able:

--to run commercially produced programs on a variety of subjects and topics;

--to program, that is, to create programs for personal, vocational, and academic applications;

--to modify or debug an existing program;

--to use computers to retrieve information, to make decisions, and to solve problems;

--to evaluate the usefulness of a program for a particular purpose; and

--to understand computer technology as a source of social

issues (e.g., invasion of privacy).

Presently a few programs are available for microcomputers that teach various facets of Computer Literacy Skills such as: computer capabilities (e.g., word processing, graphics, sound effects); history of computers; writing programs in BASIC or LOGO; using the typewriter keyboard and special control keys; and how a computer works (including rudimentary electronics).

Software Review

For all of these uses the quality of the learning experience is dependent on the software. The following checklist is recommended for evaluating software (Note 2):

A. COVER PAGE AND INITIAL INFORMATION

____1. Does the display include a "cover page" at the start of the program? (The "cover page" should include the name of the program, the version/edition, the author, source and date.)

____2. If the program is a printed copy of the program (a "listing") does the program listing include the author's name, address, machine (name, model and additional information) for which the program is written, the language and version of the language in which it is written and the date?

B. INSTRUCTIONS

____1. Are they given, or is the user told how to get them?

____2. Can they be bypassed if desired, or are they short enough to be shown automatically?

____3. Can the user return to the instructions during the program?

____4. Are they worded for the program's user age group? (age, class, ability level, etc.)

____5. Are they complete and clear?

C. INPUT

____1. Is there an indicator to show where input will appear?

____2. Does the user get hints when input errors are made?

____3. Does the program respond to illegal inputs? Are resulting error messages easy to understand?

____4. Does the program "bomb" if "bad" input is entered? e.g., entering an alphabetic character instead of a number, or just pressing RETURN.

C. INPUT (contd.)

____5. Does the input system allow for mistakes to be corrected by the user?

____6. Is the exact format of INPUT specified?

D. OVERALL IMPRESSION

____1. Is the format of the output neat? (no words running over the end of the line, lines double spaced where possible for younger users, screen not crowded, etc.)

____2. When comments, instructions, etc. appear on the screen for a limited time, is that time long enough for the words to be read and understood? —OR— Is advancing to the next "page" controlled by the user?

____3. Does the program clear the screen before and after the "cover page" is displayed?

____4. Does the program make use of motivational devices?

____Timing
____Scoring
____Graphics
____Effective personalization (informal, conversational, addressing the user by name, etc.)
____Random reinforcement
____Free of demeaning remarks
____Minimal use of violence

____5. Does the program have difficulty levels appropriate for this purpose?

____6. When appropriate, is the correct response given after a reasonable time or after a given number of attempts?

____7. Does the program allow starting over easily?

____8. Is there a standardized instruction to continue (e.g., "hit the space bar to continue") at the bottom of the page?

____9. Is the program accurate?

____Spelling, punctuation, grammar, etc.
____Is the content accurate?

____10. Is it easy to end the program? Is this done neatly (screen clean)?

____11. Is the program free of stereotypes (sex, race, etc.)?

____12. Is the program free of inappropriate language?

Useful Terms

A mini-glossary of microcomputer terms is provided. This short list of terms offers a basic vocabulary for the beginner.

Mini-Glossary of Microcomputer Terms

BIT: acronym for "binary digit"; a zero or a one; smallest unit of computer information.

BUG: an error in a program; corrected by debugging.

BYTE: a character of computer text, usually composed of 8 bits.

CHIP: small, thin piece of silicon with a circuit printed on it.

COMPUTER ASSISTED INSTRUCTION (CAI): any instructional application of computers such as drill, tutorial, demonstration, or simulation.

CURSOR: The indicator (sometimes flashing) that is moved by commands of user.

DOS: A "disk operating system," a set of programs on a diskette that manages the computer and its peripherals and allows programs to run and data to be processed.

FIRMWARE: programs fixed in the computer by the manufacturer.

HARDWARE: The physical equipment or devices which comprise a computer system (e.g., console, monitor, and disk drive).

LANGUAGES: specially created computer language systems such as BASIC, COBOL, FORTRAN, and LOGO.

LANGUAGE COMMANDS: special words in a language reserved for causing the computer to execute a function (e.g., RUN, LOAD, SAVE, and CATALOG).

MEMORY: The integrated circuits of a computer where data and information are stored (e.g., ROM=Read-Only-Memory, and RAM=Random-Access-Memory); memory capacity is measured in thousands (K) of bytes such as 32K, 48K, or 64K.

MICROPROCESSOR: an integrated circuit that executes instructions such as a Central Processing Unit (CPU); a microcomputer is a computer whose CPU is a microprocessor.

PERIPHERALS: equipment designed to communicate with a CPU or to display CPU outputs such as a printer, a graphics board, or a disk drive; sometimes these devices are integral parts of the computer console.

PROGRAM: a list of instructions to tell a computer what to do; may be from one to ten or more on a diskette; a lesson or unit of instruction; programs are written by programmers who do programming; programs are also called "software."

A Crucial Logistics Problem

It is not unusual to find 10, 20, 30, or even 50 microcomputers in an urban or suburban junior or senior high school. In elementary schools it's a different story. There the mode is one or two per school. Thus, in an elementary school a key problem is allocating principal, teacher, and student time at the console. And, for good or ill, social studies time on the microcomputer may be totally unprovided for. Below are listed some brands of microcomputers used in American schools:

—Apple II Plus and IIe

--Atari 800 and 1200

—Commodore 64, C128, and VIC20

--Compucolor II

—IBM Personal Computer (PC)

--Osborne I and Executive

—Texas Instrument T199/4A and T199-2

--Radio Shack TRS-80 and Model III

How One School District Does It

Following are excerpts from an interview with Gary Steward, K-12 Computer Education Coordinator in Weld County School District 6, Greeley Colorado:

Q. How did you and your staff become interested in microcomputers and how is this interest maintained?

A. We can't ignore the publicity in educational journals and media advertisement the past two to three years. Also, the impact many of our students having acquired their own computers at home can't be overlooked. In January 1981 there was a district task force that wrote a position paper on technology. In fact, the district superintendent was the task force chairman. Also, at that time, 30 district personnel had just finished the first session of a computer literacy course at the University of Northern Colorado. Those 30 people spread the word throughout the district and the desire to become involved spread like wildfire. However, in a school, there must be a person knowledgeable about microcomputers and their application—a "spark plug" who can assist, encourage, and troubleshoot to maintain that interest.

Q. What specifically is happening at the elementary level?

A. At the elementary level we are striving toward computer

literacy for students in our PEAK program. It's a gifted and talented program. We're working directly with the PEAK teachers in giving them computer literacy--actual programming using a specific language they will share with their students. In addition to the PEAK teachers, we have microcomputers in elementary schools and teachers are beginning to use them with all students. In these schools we are not teaching the BASIC programming language. We are using commercial programs.

Q. What's the most common pattern of use of microcomputer use in your elementary schools?

A. The most common pattern is small group with teachers working with 10-15 students at one time with one microcomputer. They use it as a demonstration device, using mainly simulation programs with kids taking turns doing parts of a program. The next most frequent use would be with an entire class. The computer is set up right now on a cart for movement, so it can be moved from room to room.

Q. What is being done with social studies?

A. Mostly simulations. We do very little drill and practice, mainly because it's very difficult to cue elementary kids on the computer.

Q. What's your view on how computers ought to be used in schools?

A. Primarily, we would like to see the in-classroom use, because the teacher is in control of the situation. If we use one central location, the teacher has to relinquish the children. The other person may not know exactly what the teacher wanted to accomplish.

Q. In your experience, what is an ideal computer-student ratio for in-classroom use?

A. One computer per 15 students.

Q. If you were to give advice to teacher educators regarding teacher training and microcomputers, what would you tell them?

A. Spend time helping trainees use the microcomputers in the classroom, especially keyboard operation and use of existing software. Too frequently I see inservice and preservice training of programming itself. This is frustrating for all. Exposure to published programs and using those programs gives the teacher confidence in being able to deal with the microcomputer in the classroom. That's really what we need more of.

Q. If you were to give recommendations to software producers, what would you say about materials they should develop?

A. They must spend more time in producing simulations and demonstrations. These are programs that teachers do not need to develop themselves. I am sorry to say that most of the software is drill and practice. In my opinion, this is not good use of the technology. Using the technology available to enhance a specific concept in the initial stages of learning is a better use of technology. Educators should choose software to fit district curriculum objectives. We do not want to change our objectives and programs to fit the technology and available software. Software producers must find out about school district objectives and produce materials to fill them.

Something To Think About

Currently there seems to be great optimism concerning the possible educational uses of microcomputers. The idealists are citing the possibility of creating intellectually stimulating environments for teaching all subject matter. They see as a goal the development of a generation of adults able to perform logical thought, to process vast amounts of information, and to perform analytic tasks. Ideally, students may have at their fingertips the resources of highly complex, flexible information storage, retrieval, and processing--truly powerful resources.

As we examine the current situation in schools, we are aware that the present predominant use pattern of microcomputers is with a single individual at a time. We know there is currently precious little software (courseware) of sound educational value, especially in the social studies. Another reality is that the cost of microcomputers is high relative to other classroom learning materials. The degree to which the gap between the ideal and the real can be bridged certainly will set the direction in social studies and in other curriculum areas, for the next 20 years or more.

In the process of making changes, a number of issues arise. Will extensive use of microcomputers result in the decline of the development of student social interaction skills? This is a critical issue for social studies educators. Will the computer age take away the level of curiosity of young people? Will microcomputer use result in further reductions in teaching staff? Like other innovations in education, will the rich districts become richer and the poor poorer? These issues, and others, are important to analyze and resolve.

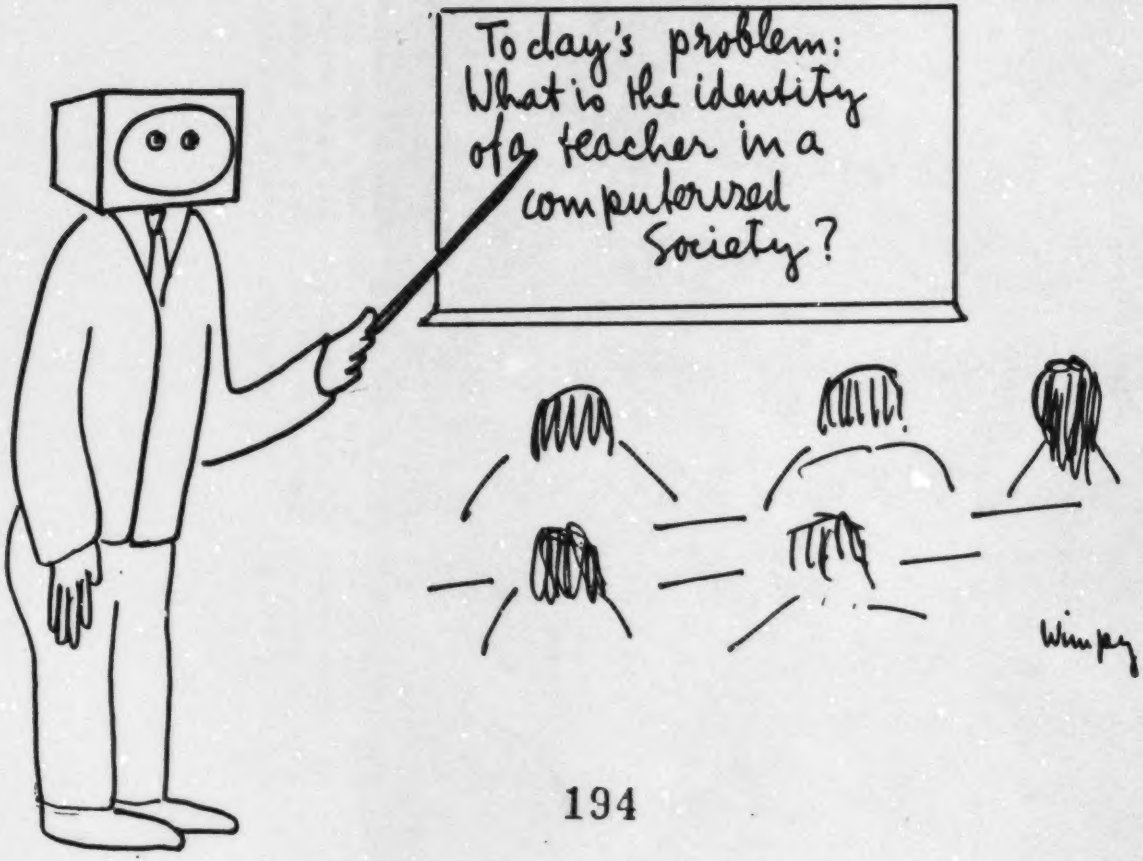
Will our educational future be the age of new technology...the

age of the computer...the age of information? Perhaps Asimov is correct when he says, "We are reaching the stage where the problems that we must solve are going to be unsolvable without computers. I do not fear computers. I fear the lack of them." (Isaac Asimov, Time, February 20, 1978).

Footnotes

Note 1 One treatment of microcomputers in social studies is: Ronald Saltinski, "Microcomputers in Social Studies: An Innovative Technology for Instruction," Educational Technology, Vol. 21, No. 1 (Jan. 1981).

Note 2 This is a variation of a list from the COMPUTING TEACHER, May 1982, p. 48-49. Developed by SOFTSWAP, SMERC Library, San Mateo County Office of Education, 333 Main Street, Redwood City, CA 94063. Modified by Dr. Marc Swadener, School of Education, University of Colorado, Boulder, CO 80309.


Today's problem:
What is the identity
of a teacher in a
computerized
Society?
Wimpy

COMPUTER LITERACY AND SOCIAL STUDIES TEACHER EDUCATION: NEEDED CHANGES

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Rapid change in computer technology in recent years is having an effect on society. The information age is upon us. Educators must acknowledge the important role we must play in preparing individuals for a society which the control and manipulation of information represents. Social studies educators have a vital role in helping students prepare for an information oriented society in which the control and manipulation of information affects all human endeavors. Unfortunately, the vast majority of social studies educators are unprepared for this task. The professional literature in social studies education is, relatively, devoid of information on the history of computers and related technologies as well as the skills necessary to utilize these technologies in the classroom (note 1). The lack of attention to computer technology is a problem which requires immediate attention by social studies educators as well as educators in general (11).

The major purpose of this paper is to discuss the needed changes in social studies teacher education to prepare teachers for the task of developing computer literate students. The rationale for the suggested changes in social studies teacher education is based on a comprehensive definition of computer literacy which requires changes in the traditional curriculum and instruction in social studies classrooms. Therefore, the paper first presents the comprehensive definition of computer literacy. Next, a description of the changes needed in social studies curriculum and instruction to achieve this definition of computer literacy is given. Finally, the needed changes in social studies teacher education is examined.

Social Studies Computer Literacy Objectives

Numerous articles have been written on a general definition of computer literacy (e.g., 4,5,6,7). Although there is variation and at times disagreement (e.g., 9) in these definitions, Sesow and Stricker (12) found enough consistency to describe three main components that are involved in the concept of computer literacy. The first major component is **awareness** which involves understanding how computer technology affects individuals and society. The second major component is **acquisition** which includes understanding of how computers work and how a computer is operated. The third component is **application** which constitutes employing computer technologies to solve problems and develop intellectual skills. Examination of the more specific meanings that Sesow and Stricker (note 2) attached to the components of awareness, acquisition, and application provided a list of thirty general objectives for developing the computer literacy of students (Table 1).

Seventeen of the 31 general computer literacy objectives are or should be objectives of social studies education. Social studies clearly has a major responsibility for developing all 10 of the **awareness** objectives. Three of the **acquisition** objectives are a joint responsibility of social studies education, and four of the **application** objectives are a joint responsibility of social studies (see Table 1).

The remaining **acquisition** and **application** objectives are more appropriately the responsibility of other courses. If a school or school system does not provide students the needed educational experiences to develop these remaining objectives, then social studies educators may have to take on these remaining objectives also.

Needed Changes in Social Studies Curriculum and Instruction

Based on the assumption that social studies has a responsibility for developing computer literacy, the general objectives listed in Table 1 indicate a need to change both the curriculum used in social studies as well as the instructional procedures used to deliver social studies content. It is important to remember that computer technology

Table 1

General Objectives for Developing Computer Literacy

AWARENESS OBJECTIVES

*1. Knows how use of computers will improve one's life.
*2. Knows the historical events preceding the development of computers and microcomputers.
*3. Knows how computers can be used for telecommunications and satellite communications.
*4. Knows the changes in vocational fields as a result of use of computer technology.
*5. Knows the possible uses of computers in business and industry.
*6. Understands the potential impact of computers on one's life.
*7. Understands the future impact of computers on individuals and society.
*8. Analyzes one's attitudes about using computers.
*9. Analyzes the attitudes and values others place on computers.
*10. Evaluate the legal and ethical questions related to computer use.

ACQUISITION OBJECTIVES

11. Understands operations of computers and related technologies.
12. Understands the theory of computer operations.
13. Understand the capabilities and limitations of computers.
14. Applies computers to assist in learning basic skills
**15. Applies computers as a tutor.
**16. Applies computers to assist in homework assignments.
**17. Applies computers to simulate real events.
18. Understands how to keep records on computers.
19. Understands how to program a computer.
20. Understands how to use computers for word processing.

APPLICATION OBJECTIVES

**21. Demonstrates ability to work with others to solve problems.
**22. Applies computer resources to make decisions in one's personal life.
23. Applies computers to examine new areas of learning.
24. Demonstrates creative use of computers.
**25. Applies computers to collect, store and retrieve data.
**26. Writes computer programs to solve problems.
27. Writes programs for one's own use.
28. Writes programs to increase one's productivity.
29. Writes learning programs to be used by others.
30. Shares developed programs with others.

*Objectives for which Social Studies has major responsibility.

**Objectives for which Social Studies has joint responsibility.

is both a subject matter to be studied plus an instructional tool to be used during classroom activities. Social studies has the major responsibility for using computer technology as a subject matter for the awareness component of computer literacy. The joint responsibility to develop the acquisition and application components of computer literacy is fostered through use of computer technology as an instructional tool.

New Curriculum in Social Studies

The "new" curriculum in social studies should include examination of the effects of computer technology on the past, present, and future. Students need information on the historical development of computer technology and how it has affected individuals and societies. This is the content of social studies curriculum. In the new curriculum current events related to computer technology may be used to make students aware of changes in vocational fields and leisure time. Future studies in the new social studies curriculum would prepare students for potential changes in individual lifestyles and societies wrought by computers.

Although the historical, sociological, psychological, political, and economic implications of computer technology are important content for the new social studies curriculum, the issue of legal and ethical questions related to computer use and abuse are also of major importance. Computer technology allows a great deal of information to be gathered on individuals and groups, and the potential for abuse is high. Computer data theft is an ever present problem and will likely increase in the future. A sound review system based on legal-moral democratic principles to limit the abusive use of computers will be a necessity, and the new social studies curriculum must deal with these ethical and legal issues in the classroom.

To aid in developing computer literacy does not require that social studies educators abandon the traditional curriculum. But it does demand that history teachers go beyond current textbook information and focus some class time on the history of computer

technology. Likewise, in other social science courses traditional content should be enhanced with topics related to computer technology.

New Instructional Procedures

The acquisition and application objectives for which social studies has joint responsibility require the use of computers and related technologies in the classroom. There are five types of computer assisted instructional modes which social studies teachers need to utilize: **tutorial mode, drill and practice mode, gaming mode, simulation mode,** and **problem solving/research mode.** Tutorial mode involves providing text to a student followed by questions covering the material. In most tutorial programs, respondents continue working on the material until a specified level of mastery is attained. Drill and practice mode involves mere questions on a topic with students working toward a specified level of mastery. Gaming and simulation modes are merely computer application of traditional gaming and simulation instruction in social studies. Problem solving/research mode requires students to program a computer for data processing or use package data processing programs to analyze information on a given topic.

Social studies teachers can use the tutorial or drill and practice modes instead of the typical worksheet or workbook exercises employed in the traditional social studies curriculum. With either of these modes, students can work towards some specified level of mastery before going to another topic, and information on each student's performance can be stored for teacher use later. At the same time students would be developing the acquisition computer literacy objective of knowing how to use computers as tutor.

Gaming and simulation modes can be used in social studies classrooms in both individual and group settings. For gaming, computers can randomly pick questions, keep score, and make decisions on the winners with great speed. For simulations, computers can accept input from students, indicate decision outcomes according to some underlying model, report results without the time consuming task of "calculating" required of teachers using traditional simulations.

Using these modes with traditional social studies content develops the acquisition and application computer literacy objectives of knowing how to use computers to simulate real events, and demonstrating an ability to work with others to solve problems.

One of the most promising potentials for computer use in social studies classrooms is with the problem solving/research mode. Computers can use package programs or be programmed by students (with teacher aid) to accept information and process information needed to solve some problem or provide evidence for research questions. Also, computers can access information from large data banks through telephone connections in order to acquire needed information to solve a problem or to provide evidence for research questions. Using this mode simultaneously will develop all of the application social studies computer literacy objectives listed in Table 1.

An added benefit of using computer assisted instruction is the ability to individualize instruction. When a student has difficulties with particular learning material, he/she can use the computer for remediation work. Likewise, when a student has completed normal assignments, he/she can use the computer for enrichment activities.

Needed Changes in Social Studies Teacher Education

To this point the discussion has focused on the general meaning of computer literacy and the role of social studies in developing computer literacy in students. Obviously, social studies teachers will need to become computer literate. Examination of the general objectives for students listed in Table 1 forms the basis for objectives related to computer literacy for social studies teachers. However, the definition of computer literacy for teachers must be expanded to provide the skills necessary to use the five modes of computer assisted instruction.

Besides the ten awareness objectives listed in Table 1, social studies teacher education programs must take responsibility for additional objectives whereby social studies teachers:

1. Know the possible uses of computers for management (i.e., test construction, record keeping, preparation of course materials) and instruction.
2. Know sources of computer hardware and social studies educational software.

Social studies teachers need to develop the social studies and non-social studies **acquisition** and **application** objectives listed in Table 1. In addition to the **acquisition** objectives for students, social studies teachers need to:

1. Understand how to evaluate computer hardware and social studies educational software.
2. Understand how to write social studies computer assisted instruction programs.

Certain **application** objectives are also of importance to social studies teachers. They should be able to :

1. Apply mini-authoring systems to develop social studies drill and practice and tutorial programs.
2. Apply authoring languages to develop social studies gaming, simulation, and problem solving programs.
3. Apply packaged programs for management and social studies instruction.

To develop all of these objectives, social studies teacher education programs must alter the present curriculum and instructional procedures they use.

Curriculum of Social Studies Teacher Education Programs

To help teachers achieve computer literacy, information on the history, current status, and future implications of computer technology should be taught in teacher education programs. This information could be taught in a separate course or as part of an existing course. The course could be taught in the arts and sciences or in the education curriculum. Within such a course, extensive discussion of the legal and ethical issues of computer technology

should be included to provide a depth of perspective for social studies teachers.

To develop the objectives related to operation and use of computer hardware and social studies software, several courses should be developed. A course is needed to develop skills necessary to operate computer hardware and social studies software, use management and instructional programs, become familiar with the native language of the computer (currently BASIC), and use the computer for word processing. A second course should be taught on how to form text files, use programming languages, and utilize related technology such as videodiscs, modems, etc. For social studies teachers who want to become developers of computer related materials, a third course encompassing more advanced programming procedures should be offered.

To develop the awareness, acquisition, and application objectives for students, teachers will need the background information on computer technology and the first two courses in operating computer hardware and software. The background and first course should be made available in preservice teacher education programs and in graduate programs for inservice teachers who have not had this preservice training. The second course would best be offered for inservice teachers on the graduate level. As noted by Wells and Bitter (13), inservice workshops do not provide the time to adequately train teachers to be computer literate. Inservice workshops can help develop computer **awareness**, but they do not provide the time necessary to develop the **acquisition** and **application** objectives for a computer literate social studies teacher.

The third advanced course mentioned should be located in a graduate program. Most social studies teachers would not need to attain the advanced skills . However, such a course would be useful to the very few social studies educators who want to produce social studies course materials for themselves or others.

The idea that teachers, including those in social studies, need to be able to program has been advocated by others (e.g., 1,8). However, this does not mean social studies teachers need to use machine or assembly language to write programs for classroom use.

There are a number of mini-authoring systems (2), and programming languages (e.g., PILOT) which make the task of program writing easier.

Instructional Procedures in Social Studies Teacher Education Programs

To successfully develop the acquisition and application teacher computer literacy objectives, social studies teacher education coursework should use computer assisted instruction. Preservice and inservice teachers should be exposed to using computers as they learn about management and instruction in social studies classrooms.

Tutorial, drill and practice, and simulation modes of instruction with computers should be used to develop managerial and instructional skills. Packaged programs should be used to help preservice and inservice teachers write lesson plans, construct tests, and score and grade tests. Word processing systems should be utilized to prepare class materials.

In addition, demonstrations of instructional materials related to computer technology should be included in any preservice or inservice course. This should include the use of data banks for the problem solving/research mode and vidiosystems for tutorial, gaming, simulation, and problem solving/research modes.

The use of computer assisted instruction in actual coursework taken would provide an additional benefit. Individualized training of social studies teachers can be done without the time consumption of the past. Preservice and inservice teachers can work towards mastery of the traditional content of social studies teacher education courses and, at the same time develop their computer literacy.

Conclusions

The major purpose of this paper was to outline the needed changes in social studies teacher education in the era of the computer revolution. Like Beck (1), this author used a specific definition of computer literacy for students to guide the decisions on what social studies teacher education should be like.

In the suggested content for social studies teacher education, there is an emphasis on teacher skill in programming. Some may

dispute the need for teachers to program computers; however, without this skill (on an intermediate level at least) teachers will not be qualified to use the problem solving/research mode. It is this author's contention that the problem solving/research mode of instruction is the most useful mode to enhance computer literacy in students, as well as enhancing traditional social studies content.

A major implication of the suggested changes in the curriculum and instruction used in social studies teacher education is the need for social studies teacher educators to become computer literate. In addition, colleges of education must find the resources to provide social studies teacher educators with the ability to implement the changes suggested. Without the retraining of social studies teacher educators and the accompanying resources, developing computer literate social studies teachers is impossible. In turn, social studies teachers who are not computer literate cannot develop computer literacy in students. It is, therefore, the training institution which will determine whether a truly "computer literate" society will be achieved.

Notes

[1]There have been articles on computer technology and social studies (e.g. 3), presentations at annual meetings (e.g., 10), and a special section in the May 1983 issue of Social Education. In comparison with the magnitude of the general literature on computer literacy and computer assisted instruction, however, social studies writings on the subject are very small.

[2]The source of the more specific definitions of awareness, acquisition, and application came from the **Computer Literacy Needs Assessment** instrument developed by Sesow and Stricker.

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SATELLITE TELECOMMUNICATIONS IN EDUCATION: AN OVERVIEW OF RELATED ORGANIZATIONS AND ACTIVITIES

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Satellite telecommunication is an integral part of the new information technology. We--the global "we"--now have the capability to move data, sounds, and images around the world instantaneously. This meeting could be presented "live" to the eyes and ears of people in Angola or Australia, Botswana or Bangladesh, Chile or China, Gabon or Guatemala, Yemen or Yugoslavia, to name but a few of over one hundred other countries now capable of participating in such an event. The technology has been here for years, and it will continue to be refined to become more technically powerful, efficient and available.

Satellite Systems

By now, many of us are familiar with the major components of satellite technology that enable such worldwide communication. Briefly, these components include the following:

An originating ground station that produces program signals and transmits them to a satellite. The signals transmitted may be audio, video or data. These signals are routed through switchers to a microwave transmitter that produces carrier frequencies and superimposes program signals, then on to a transmitting antenna which directs them to the satellite;

A satellite with up to 24 channels, or transponders, each capable of carrying different information. The transponder receives a signal (the "uplink") from the originating ground station, changes the signal's frequency so it won't interfere with incoming signals, and redirects the signal (the "downlink") to Earth through its transmitting antenna;

A receiving ground station that receives the downlink on its antenna, and converts the signal to the original medium of audio, video, or data. The downlink can be received by an appropriately equipped antenna within the transmitting satellite's "footprint." Footprints vary in size, but it is possible to cover most of the Earth with only three satellites spread out appropriately in space above the globe.

At the end of 1982 there were about 500 earth stations providing

1,200 pathways or direct communications links via satellite among 170 countries, territories and areas of independent sovereignty, and more earth stations are being built (5). In addition, many thousands of "dishes" pick up satellite signals around the globe.

Satellites are positioned approximately 22,300 miles above the equator. They orbit at the same speed as the Earth spins, so they appear to be stationary (thus, "geostationary orbit," the technology jargon for the movement or positions of these satellites). As you might imagine, satellites are most cost-effective and appropriately used for reaching large numbers of geographically dispersed users. Most satellites currently in use are designed primarily for low-powered, fixed-satellite services, such as radio, television, telephone, telegraph, telex and data. In the planning stages are higher powered satellites that will be used for direct broadcasting to any location that has the appropriate receiving equipment. Receivers are now being scaled down in size and up in receiving capabilities.

Currently, over one hundred satellite communication systems are operational or planned: three international systems, four regional systems, forty-eight dedicated domestic systems, forty-one leased or shared-use domestic systems, nine military systems and fourteen experimental systems. (Table 1.) In addition to their commercial applications (for which U.S. domestic systems are heavily employed), these systems will be mainly involved in data transmission, meteorology, maritime communications, air navigation and remote sensing, i.e., gathering information in such areas as agriculture, fisheries, forestry, land use, soil surveys, water management, wildlife, and rural disaster monitoring (10,34).

Satellite-related International Organizations

In thinking about satellite systems, it is important to be aware of some of the key international organizations that directly or indirectly affect the traffic carried on satellite systems and the costs users may incur.

One of the most well-known and influential organizations is Intelsat, the International Telecommunications Satellite Organization. At the close of 1982, it had 106 member countries. Intelsat owns,

maintains and operates satellites for use of all countries--members or not. Its system may be used for international or domestic public telecommunications services. It is a financial cooperative whose ownership is shared by all its member countries. Members contribute to the capital requirements of Intelsat in proportion to investment shares based on their use of the system. After operating expenses, the remaining revenues are shared proportionately among the members. In effect, they pay themselves back. Intelsat's satellite communications business covers telephone, telegram, telex, television, computer data transmission, document facsimilies, and electronic mail, all handled by six satellites: three over the Atlantic Ocean, two over the Indian Ocean, and one over the Pacific. The second segment of Intelsat is the ground segment, hundreds of earth stations around the world that in general are owned by the international telecommunications organizations or postal services of the countries in which the stations are located (8).

Another international organization in the satellite business is INTERSPUTNIK, the International System and Organization of Space Communications. Its members are Afghanistan, Bulgaria, Cuba, Czechoslovakia, Democratic Yemen, the German Democratic Republic, Hungary, Mongolia, Poland, Romania, the USSR and Viet Nam. It uses two satellites, one over the Atlantic, one over the Indian Ocean, for telephone, telegraph, radio and television programs orginated and/or received by thirteen ground stations. Other countries than the members also may use the system.

The European Space Agency (ESA) represents eleven nations in its telecommunications activities: Belgium, Denmark, France, the Federal Republic of Germany, Ireland, Italy, the Netherlands, Spain, Sweden, Switzerland and the United Kingdom. Austria, Norway and Canada are affiliated through other arrangements. One of ESA's objectives is to set up a network for telephone, television, teleconferences and data transmission. However, their system is not yet operational (17).

There is also the fledgling ARABSAT, the Arab Satellite Communication Organization, with 21 member Arab states. While they intend to have a system furnishing regional and domestic telephone, telegraph, telex, data transmission and television, both their ground and

satellite systems have yet to be established (17).

The International Telecommunications Union (ITU) is an organization of member countries (approximately 150), headquartered in Geneva. The ITU is over 100 years old. It does not operate a satellite system of its own; rather it convenes world and regional administrative conferences (WARCs and RARCs) at which its members set regulations governing the use of the broadcast spectrum and allocations for satellite orbits. In addition to those responsibilities, the ITU publishes technical information and fosters technical cooperation in telecommunications development and usage. On a day-to-day basis, the ITU is responsible for the management and application of the regulations governing the use of the radio frequency spectrum and the geostationary satellite orbit. Two ITU committees, the International Radio Consultative Committee (CCIR) and the International Telegraph and Telephone Consultative Committee (CCITT) study technical aspects and operating principles for all space services and for interconnecting satellite systems with land systems (9).

The UN has a number of committees, subcommittees and divisions concerned with "space activities," as they call them. Some of these have little direct relationship to education, being for scientific, maritime, resources, energy and disaster relief. But others, such as the Outer Space Affairs Division, UNESCO (especially its Division of Methods, Materials and Techniques, and the Center for Science and Technology Division), are playing important roles in developing satellite technology and expanding the involvement of the nations of the world in telecommunications activities. Especially important is the UN Committee on the Peaceful Uses of Outer Space, which is the UN agency taking the lead in coordinating the UN's efforts for international cooperation in the full spectrum of activities involving the uses of outer space, including but not limited to satellite telecommunications (10).

Another satellite-related international organization is the International Program for the Development of Communication (IPDC), an effort by several dozen countries to enhance the communication capabilities of the developing world. It is partly supported by UNESCO and partly by voluntary contributions of its members. It has

recently funded a number of world-wide, regional and national projects involving radio and television broadcasting, the press, films, telephone and satellite communication, but has little current emphasis on education.

There are a number of other specialized agencies concerned with space and satellite technology: the World Meteorological Organization, the World Health Organization, the International Civil Aviation Organization, the Inter-governmental Maritime Consultative Organization, the International Atomic Energy Agency, and the World Bank, known less well by its more formal name of the International Bank for Reconstruction and Development, whose Education Department (though small) provides assistance to developing countries for using communication media, including satellites, to upgrade and expand education.

One unique organization, based in the United States but focused internationally, is the Rural Satellite Program, funded by the U.S. Agency for International Development (AID). The Rural Satellite Program is designed to help develop and demonstrate the potential impact of satellite-based communication technologies on Third World development efforts. The Program has centered its efforts on improving the availability of food, health and family planning services, productive work and income opportunities, and access to education. It is currently sponsoring two of the projects that will be described later in this paper, one in the Caribbean and the other in Indonesia (2).

Educational Uses of Satellites

The extent to which any of the international, regional, or domestic organizations may actively facilitate the educational uses of satellites varies. Educational uses of satellites are certainly not unknown, however. In the last dozen or so years, there have been a number of satellite-based projects for educational purposes. Most of these had brief lives--some a few months or a year; one was only a day's demonstration. Others lasted longer and a few of these are still in operation today. Some examples of the more significant and long-lived are:

the Satellite Instructional Television Experiment (SITE) in India;

the Pan-Pacific Education and Communication Experiments by

Satellite (PEACESAT) in the Pacific Basin;

the Appalachian Education Satellite Program (AESP) in the United States.

Satellite Instructional Television Experiment (SITE)

In 1975, India began an experiment to assess the effectiveness of television as an educational medium for its rural population. Programming on national integration, education, health, nutrition, population and agriculture was beamed via satellite to 2,400 remote villages, each having no more than 3,000 inhabitants, in six clusters, one in each of six states. The satellite programs were also rebroadcast, and supplemented by radio, print materials and face-to-face contact. Results of the project indicated that:

Children in TV classrooms showed significant increase in language development; TV apparently did not have the desired effect on school enrollment or absenteeism figures.

The average audience for the evening programs was about 100 people per TV set, or about 200,000 nationally, with small farmers and landless laborers forming the majority audience.

More males than females reported viewing.

In general, the experiment had greater impact on lower castes, illiterates, females, low income groups, and those who reported regular viewing.

There were statistically significant gains in health, family planning, political information, and overall modernity.

There was no measurable gain in agricultural knowledge partly due to the region specificity of such practices.

The results of the project should be viewed in light of certain facts:

Development of SITE hardware began in 1970, software not until 1974. The total project effort took 3,300 person years, of which 2,050 went to hardware and only 850 software. Eighty-two percent of the costs were incurred on hardware, 9 percent on software;

Thirty-four days before SITE broadcasts were scheduled to start, Indira Gandhi declared an Internal Emergency which involved the full censorship of all media; many of the news segments were used to transmit information on the emergency;

An important part of the experiment's design was an attempt to dub two sound tracks on a single audio program for paired neighboring states that spoke different languages;

The village TV set was augmented with a special antenna and a

pre-amplifier converter; total cost of the set, manufactured in India, was around $1,000 (3).

Pan-Pacific Education and Communication Experiments by Satellite (PEACESAT)

A system that became operational in 1971 for twelve participating nations, most in the Pacific Basin, PEACESAT linked remote locations to central services through the use of satellite, two-way ground terminals, teletype, blackboard-by-wire, computer, and still-frame pictures. The system was designed to augment health, education and community services. Each ground terminal linked to the satellite was operated by a government agency or regional educational institution. The system is still in operation.

Application of the PEACESAT system provided support in the general areas of health and education, and in community service projects such as news exchange, dialogues between politicians and their constituencies, and inter-library loans. During PEACESAT's first year of operation, a plan was developed for meeting inter-library loan requests by facsimile or airmailed microfiche, thus allowing collections to be enlarged without the accompanying costs of acquisition and storage. A project providing for regional news exchange helped strengthen cooperative efforts among the participating nations, particularly in health and education, by increasing their understanding of each other's culture.

Of the various experiments conducted within the project, about one-third involved medical and health personnel. Users shared information regarding administrative planning, diagnostic consultations, public information on health education, and in-service training, with the opportunity for consultation through two-way transmission proving to be the most valuable application. Other noteworthy results:

During the epidemic of the dengue fever virus, the satellite link provided the opportunity to monitor progress, exchange information, transmit lab reports, and share treatment plans.

A "Conference of PEACESAT Users," transmitted in April 1975, made possible an interim evaluation of the first four years of the project.

Users found that links facilitated by satellite encouraged mutual confidence among participants and decreased control by outside decision makers in planning public service programs (3).

Appalachian Education Satellite Program (AESP)

Begun in the early 1970's when the Appalachian Regional Commission

was trying to find ways to provide in-service teacher training to remote, mountainous and poor areas, the AESP combined the use of a satellite, television, video, two-way audio, face-to-face contact and print material to reach residents of thirteen Appalachian states. The program was broadened to provide undergraduate and graduate courses and short workshops in education, human resources and services, medicine and health, business and industry, and government. The program has now evolved into a commercial enterprise, ASCN: The Learning Channel, discussed below.

The first phase of the AESP program offered four graduate-level education courses. Following this successful demonstration, needs assessment and program planning resulted in a greatly expanded effort to provide communities with specifically targeted programming. The number of regional receiving sites increased steadily. In 1978, 1,649 persons enrolled in nine courses offered by AESP via satellite. College credit for these courses was granted by 52 colleges and universities in Appalachia. Thirty workshops were offered in which a total of 7,700 persons enrolled.

The years of successful programming with NASA's experimental satellites gave AESP the necessary experience in administration and delivery to continue its public service programming using commercial satellite. AESP's non-profit corporation, the Community Service Network (CSN), contracted for 2,000 hours per year on RCA's SATCOM-1 (approximately 30 hours per week), beginning in 1979. AESP was one of the few educational experiments to date to make the successful transfer from experimental to commercial satellite. A new element of the delivery system was the addition of a potential 18 million viewers via the nationwide cable television network, which included 1,275 earth stations in 1979 (3).

Satellite-based Educational Programs

There continues to be interest in this country and others in the educational applications of satellite technology. If anything, the interest seems to be growing. Over the next ten years or so, the use of conventional fixed satellite systems and direct or semidirect television or radio broadcast satellites will improve the capacity of many countries to use their communications technologies for general

economic and social development. Satellite systems may be used to supplement and enrich existing educational programs or establish new programs. No one, of course, expects satellites to replace conventional classroom education.

University of the South Pacific (USP)

The University of the South Pacific first participated in a satellite-based education effort when it joined the PEACESAT project in 1972. Two years later it launched its own independent project. It serves eleven countries spread over some 11 million square miles in the Pacific. The USP Network provides material for 1,400 full-time students on the main campus in Suva, Fiji, and extension studies for another 1,300 students, more than half of whom are distributed throughout the remaining countries in the Network. The Network relies on satellite-linked audio teleconferencing to provide students with tutors and quick turnaround time on tests and assignments. Each of the nine university extension centers is linked to the main campus in Suva, where an instructor can conduct a class for local tutors and students thousands of miles distant. Anyone at any location can speak to and hear anyone at any other location by using simple microphones. Microcomputers have recently been added at each location, and slow-scan video (which transmits still-frame images that can change after a number of seconds) is in use at three sites (1).

University of the West Indies

A satellite-based audio teleconferencing system is now being installed at the University of the West Indies that will enable the university to expand its educational services in the Caribbean. The project is one of several that have been fostered and supported by the AID Rural Satellite Program. The system links the university's three main campuses--in Jamaica, Trinidad and Barbados--with each other and with extension centers on St. Lucia and Dominica. It will be used initially for distance teaching, training, and administrative teleconferencing. Interestingly, a good part of the distance teaching applications of the system center upon courses in the social sciences and the tests students must pass to earn their bachelors' degrees in social science. In addition to the audio system, the university is considering the integration of facsimile, telewriters, computers and

slow-scan television (33).

Indonesian Programs

In 1976, Indonesia began its Palapa satellite system. The system provides telephone, telex and telegraph services on a commercial basis to its widely-dispersed population. Recently, a new project has been initiated to address educational needs created by problems of communication, transportation, administration, lack of funds, shortages of teachers, and increasing enrollments. Here, too, the AID Rural Satellite Program has helped develop the project. Ten sites will be linked by a new audio conferencing system: eight campuses of the Eastern Islands University Association, one of its extension centers, and the Bogor Agricultural Institute. The existing Palapa satellite will support the two audio channels, one for teleconferencing and the other for audiographics. Initially, facsimile will be used so that lecture notes and other print materials can be transmitted to all sites. Telewriters and slow-scan television may also be tested to see if they meet the universities' needs. In addition to distance teaching, the system will be used for faculty upgrading, administration and sharing of research results and library resources (2).

Alaska

Alaska, too, has problems in delivering quality education to isolated villages and towns with a limited supply of teachers. It was an early experimenter with satellite-based delivery of education services, and now has about 100 telephone earth stations and over 100 television receiving sites. Every community of 25 or more people has satellite communication services. Alaska uses one transponder that is dedicated solely to educational television. A statewide audio conferencing network and a computer network for self-instruction are also in place. The audio conferencing network is used extensively for in-service teacher training, continuing education and program administration. One hundred twenty-five sites have conference rooms with microphones and loudspeakers. The 1983 expected use for audio conferences is 1,750 hours (2).

Satellite-Delivered Education in the U.S.

Within the United States there are a number of organizations that

rely on satellites to deliver educational programming or experiences. One of these, ACSN: The Learning Channel, evolved from the Appalachian Education Satellite Program, discussed earlier in the paper. The Learning Channel provides a broad range of programming for adult learners. Its full daily schedule is transmitted via leased transponder to over 240 cable systems throughout the Unites States. Colleges and universities provide credit for courses taken by registered students, but the programming is available to anyone subscribing to a participating cable system.

A similar adult education service is provided by the PBS Adult Learning Department (ADL). Concentrating on academically accepted credit courses, ADL had well over 500 colleges and universities participating during its first year of operation (1981-'82), with more than 55,000 students enrolled in one or more of its thirteen courses. Programming is delivered via satellite to over 100 public television stations, which then broadcast the courses within their viewing areas.

While these services are primarily for delivery of programming, there are other satellite-based education services that are interactive, permitting two-way (or more) communications between users. The Public Service Satellite Consortium (PSSC) is composed of nonprofit public agencies involved in health and medicine, education, public broadcasting, library services, state telecommunications and religious communications. PSSC is most widely known for its teleconferencing services, provided through its National Satellite Network, which are tailored for each client. It does not maintain a regular schedule, but obtains transponder time as needed and designs the communications system anew for each use. Recently, the "Campus Conference Network" has been initiated by Services by Satellite, Inc., a for-profit relative of PSSC. The Campus Conference Network will link cities in the "top 50" U.S. markets through one higher education primary affiliate in each city, providing teleconferencing services to any clients. Although educational activities are not its major focus, the CCN has some obvious access and fiscal advantages for the higher education institutions that participate.

The National University Teleconference Network (NUTN) is a coalition of more than 60 higher education institutions in the United States. NUTN uses interactive audio, satellite video, and computers in expanding continuing education programs; collaborating on instructional, research and administrative issues; providing professional development for faculty and staff; and cooperating with private industry and others on national education programs.

The Close Up Foundation has made nationwide use of satellite programming for education for secondary schools. The Close Up Foundation is a nonprofit, nonpartisan organization with a variety of programs that encourage student and teacher involvement in the political process. Among their educational activities is a nationally televised series of programs in association with the Cable-Satellite Public Affairs Network (C-Span) which focus on current issues and politics. Students who come to Washington, D.C. to attend a one-week intensive experiential program are televised in the process of questioning key policymakers. During some broadcasts, two-way audio telecommunications allow students in a high school or university classroom to interact with the policymakers in the Washington studio. Live Close Up seminars are distributed over C-Span through many cable systems to schools and homes around the country. The programs may be videotaped directly off the air for educational purposes at no cost.

Two Innovative Projects

One of the most promising approaches to the international use of communication satellites in education is a project developed by the National Committee for Internationalizing Education through Satellites (NCIES). NCIES is a United States-based group consisting of specialists in language teaching, linguistics, area studies, curriculum development, educational media, satellite telecommunication, broadcasting and communication law. This group is conducting a three-phase project to teach sophisticated applied language skills and more abstract, theoretical knowledge and concepts of culture and history across national and cultural boundaries. In addition to the NCIES group, there are a number of partner institutions in the United States and other countries: University of Pennsylvania, University of Nebraska,

University of Southern California, University of Hawaii, Michigan State University, Syracuse University, Florida International University/Miami Dade Community College, Middlebury College, Universidad Iberoamericana (Mexico City), Polytechnique Institute and Channel 11 (Mexico City), Center for Advanced Means and Procedures in Education (CEMPAE) and Channel 8 (Monterrey, Mexico), Institute Tecnologico y de Estudios Superiores de Monterrey (Mexico), Preparatoria Garza Sada (Mexico), Kuwait University, and Instructional Television Center, Israel.

During the first phase of the project, NCIES developed and tested a learning systems model that would teach the applied skills and general concepts. The model projects 15-20 hours of live interactive transmissions for the academic year. Three tiers of students are involved in any satellite transmission. Tiers I and II are interactive and interchangeable, each tier being 25-30 students with about the same language level.

Tier I is the interactive group of 10-15 students who are on camera for 15 minutes of an hour's transmission. Tier II is the interactive off-camera group who are viewing live the exchanges between Tier I and the native speakers as they occur. Each Tier II becomes Tier I for 15 minutes in each hour's broadcast. Tier III/live consists on an average of 500 students at each university location who are at any level of language competence. These students observe the live interaction between the native speakers and the Tier I students as it is occurring. Tier III/delayed consists of an indefinite number of students who observe at a later time a videotape of the Tier I/native speaker exchanges. While Tiers I and II will have had full preparation for each transmission, the extent of preparation for both groups of Tier III students (live and delayed) would be at the option of each institution.

Normally, students from all three tiers would participate from their own classrooms. This system does not require a full two-way audio-video transmission. Using a transmission network other than full two-way audio-video--such as audio with slow-scan TV, or audio only, from the Tier I students to the native speakers--is not only technically feasible, but relatively inexpensive as well.

The model presupposes leasing a block of several hours of satellite time (the most cost efficient method; the first ten minutes of a satellite transmission are the most expensive) that would be shared equally among all the institutions participating in that transmission period. The institutions would be scheduled to transmit consecutively in the time block in a predetermined sequence. At any one location, Tiers I and II would also alternate with each other in a predetermined order. Tier III at each location, while never on camera (as are Tiers I and II at different times in the transmission), is nevertheless in an active learning mode, as has been demonstrated in Phase I testing.

The project is now into Phase II, which will run through the 1984 academic year. It will involve: longitudinal testing and evaluation of the learning systems model and the learning it produces; continued training of the participants in the model's operation; and testing of the model's capacity to teach technology-related skills. There will be both live satellite transmissions and simulations during Phase II, with the possibility of even more partners--at the secondary and postsecondary levels--joining the project. Phase III of the project will be a two-year operational demonstration of the learning system model using both United States and international satellite transmissions (4).

The NCIES approach lends itself particularly well to subject matter that crosses national and cultural boundaries. It can involve not only students, but faculty and administrators at all participating locations, however distant they may be. It provides a way of regularizing interactions, sharing knowledge, and entering into another culture. Transmissions need not be limited to classroom interactions--it is entirely feasible to be "on location" at any other site at which audio or video equipment can be introduced. This possibility greatly expands the potential for making such transmissions rich educational experiences for all participants. The applications of the model are only limited by creativity, given, of course, the technical capability to participate as a partner in such a project to begin with.

A second project, still in the early development stages, is the Wisconsin Global Classroom Project. It is a technical and educational program that plans to allow students in Wisconsin direct communication with students in several areas of the world. Through the use of com-

munication satellites, students will benefit from opportunities in culture and language study, international economics and politics, and world issues, and will be able to obtain direct information and opinions from across the world.

The program design includes a "satellite semester" where American students will talk directly and on regular basis with their counterparts in countries such as Japan, India, Mexico, and England. Students will see and discuss world issues with scholars and other students. Regular lectures and seminars as well as "informal" discussions will be part of the satellite semester. In addition to discussions on such topics as contemporary and future markets and jobs, politics and recreation, students will have computers available for their use in exchanging data and investigating and playing simulations and games. Program support components will include two-way television and radio.

While the initial involvement will be with one high school in Milwaukee, Wisconsin, all students in the state will have access to the satellite semester by sendi : teams of students to Milwaukee, as well as via closed circuit television, local satellite earth stations, cable television, radio, videotape, telephone, and print materials. A program coordinator will teach the satellite semester and provide inservice opportunities for teachers, students, and community people interested in international exchanges and understanding.

Conclusion

This brief overview of some of the organizations, institutions, and projects involved in the educational use of satellite communications is intended to provide a beginning point for conference participants to think about the potential of satellite telecommunications for achieving institutional and personal educational goals. By providing examples of educational activities that have already been implemented, the author hopes to encourage conceptualization of tried and innovative uses of the technology that will serve students and their teachers wherever they may be.

It should also be recognized that this paper has dealt with satellite telecommunications as a tool for educators to use as they deem appropriate. The paper has not dealt with the implications of

satellite telecommunication for individuals, cultures and our global society as a whole, topics with which social scientists must become involved in their thinking, research, and teaching. Following is a list of satellite systems and useful references.

Table 1

SATELLITE SYSTEMS*

International Satellite Systems	Current Status
INTELSAT Global Satellite System	Operational (currently 16 satellites)
INMARSAT Maritime Mobile Satellite System	Operational (4 satellites)
INTERSPUTNIK Satellite System	Operational (leased capacity from USSR)
Regional Satellite Systems	
Arabsat Satellite System	1985 Launch
African Satellite System	Under consideration only
EUTELSAT Satellite System	To be fully operational 1983-84
Palapa Satellite System	Indonesia Domestic System, regional services
Domestic Satellite Systems - Dedicated Systems	
Australian National Satellite System (AUSSAT)	Under construction for 1985 launch
Brazilian Domestic Satellite System (BRAZILSAT)	Under construction for 1985 launch
Canadian Domestic Satellite System (ANIK A-D)	Operational
China Domestic Satellite System	Project cancelled
Colombia Domestic Satellite System (SATCOL)	Contract award under consideration
French Domestic Digital Satellite System (TELECOM)	Under construction for 1985 launch
French DBS Satellite (T.D.F.)	Under construction for 1985 launch
Germany (Fed. Rep. of) Domestic Digital and TV Distribution Satellite	Planned for 1987 or 1988
Germany (Fed. Rep. of) DBS Satellite (TV-Sat)	Planned for 1986
Indian Satellite System (INSAT)	Operational (Temporarily out of service)
Indonesian Satellite System (Palapa A & B)	Operational
Iranian Satellite System (Zahreh)	Project cancelled
Italian Satellite System (Italsat)	Planned for 1986
Italian DBS Satellite System (SARIT)	Planned for 1985

* Adapted from Pelton and Filep (5).

Domestic Satellite Systems - Dedicated Systems (Continued)	Current Status
Japanese Domestic Satellite System (CS-2a, 2b)	Planned for 1983
Japanese Domestic Broadcast System (BS-2a, 2b)	Planned for 1985
Luxembourg Domestic Broadcast System (LUXSAT)	Planned for 1986
Mexican Domestic Satellite System (SATMEX)	Status uncertain
Saudi Arabian Broadcast Satellite System (SABS)	Planned for 1986
Swedish Domestic Satellite System (Tele-X)	Planned for 1986
Switzerland Domestic Broadcast Satellite (Helvesat)	Planned for 1986
United Kingdom Domestic (UNISAT)	Planned for 1986
United States	
Advanced Business Communications, Inc. (ABCI)	Planned for late 1980's
American Satellite Company System	Operational
Comstar Satellite System	Operational
CBS Satellite Systems	Planned for mid-1980's
Direct Broadcast Satellite Corp.	Planned for mid-1980's
Graphic Scanning Satellite System	Planned for mid-1980's
GT & E Satellite System (G-Star)	Planned for 1984
Hughes Galaxy Satellite System	Planned for 1983
Oak Satellite System	Planned for mid-1980's
RCA DBS Satellite System	Planned for mid-1980's
RCA Satcom Satellite System	Operational
Satellite Business System (IMB/Comsat)	Operational
Southern Pacific Communications Corp. (SPACENET)	Planned for 1985
Satellite Television Corp. (Comsat)	Planned for 1985
Telstar Satellite System (AT & T)	Planned for 1984
Tracking, Data, Relay Satellite/ Advanced Westar (NASA/Western Union)	Planned for mid-1983
United Satellite Services Broadcasting (Hubbard)	Planned for mid-1980's
U.S. Satellite System, Inc.	Planned for mid-1980's
Video Satellite System	Planned for mid-1980's
Western Union Satellite System	Operational
Western Union DBS Satellite System	Planned for mid-to-late 1980's
U.S.S.R.	
Ekran Broadcast Satellite System	Operational
Loutch Satellite System	Operational
Molnya Satellite System	Operational
Raduga Satellite System	Operational
Volna Satellite System	Planned for 1984

Domestic Satellite Systems - (Leased/Shared Use Systems)	Current Status
Algerian Satellite System	Operational
Angolan Satellite	Planned for 1983
Argentina Satellite System	Operational
Australia Satellite System	Operational
Bangladesh Satellite System	Planned for 1984
Bolivian Satellite System	Planned for 1983
Brazilian Satellite System	Operational
Cameroon Satellite System	Planned for 1984
Chilean Satellite System	Operational
China Satellite System	Planned for 1983
Colombian Satellite System	Planned for 1983
Denmark (Greenland) Satellite System	Operational
Ecuadorian Satellite System	Planned for 1983
France Overseas Territory (Reunion, Martinique) Satellite System	Operational
Germany (Fed. Rep. of) Satellite System Spot Beam 14/11 GHz	Planned for 1984
Indian Satellite System	Operational
Korean (Rep. of) Satellite System	Planned for 1986
Libyan Satellite System	Operational
Malaysian Satellite System	Operational
Mali Satellite System	Planned for 1983
Mauritanian Satellite System	Planned for 1983
Mexican Satellite System	Operational
Moroccan Satellite System	Operational
Niger Satellite System	Operational
Nigerian Satellite System	Operational
Norwegian Satellite System	Operational
Oman Satellite System	Operational
Pakistan Satellite System	Planned for 1983
Papua New Guinea, Satellite System	Planned for 1985
Peruvian Satellite System	Operational
Philippine Satellite System	Operational
Portugal (Azores) Satellite System	Operational
Saudi Arabia Satellite System	Operational
South Africa Satellite System	Planned for 1983
Spain (Canary Islands) Satellite System	Operational
Sri Lanka Satellite System	Planned for 1985
Sudan Satellite System	Operational
Thailand Satellite System	Planned for 1983
United Kingdom (Offshore Service) Satellite System	Planned for 1983
Venezuelan Satellite System	Planned for 1983
Zairean Satellite System	Operational

Military Satellite Systems	
NATO Military Satellite Communications Project	Operational
U.K. Skynet Defense Communications Network	Operational

Military Satellite Systems (Continued)	Current Status
U.S. Military Satellite Communications Network	
U.S.A.F. Communications Satellite System	Operational
U.S. Defense Satellite Communications System	Operational
U.S. Naval Satellite Communications System	Operational
U.S. Fleetsatcom Communications System	Operational

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